

MARINE REVIEW.

VOL. VI.

CLEVELAND, OHIO, JULY 28, 1892.

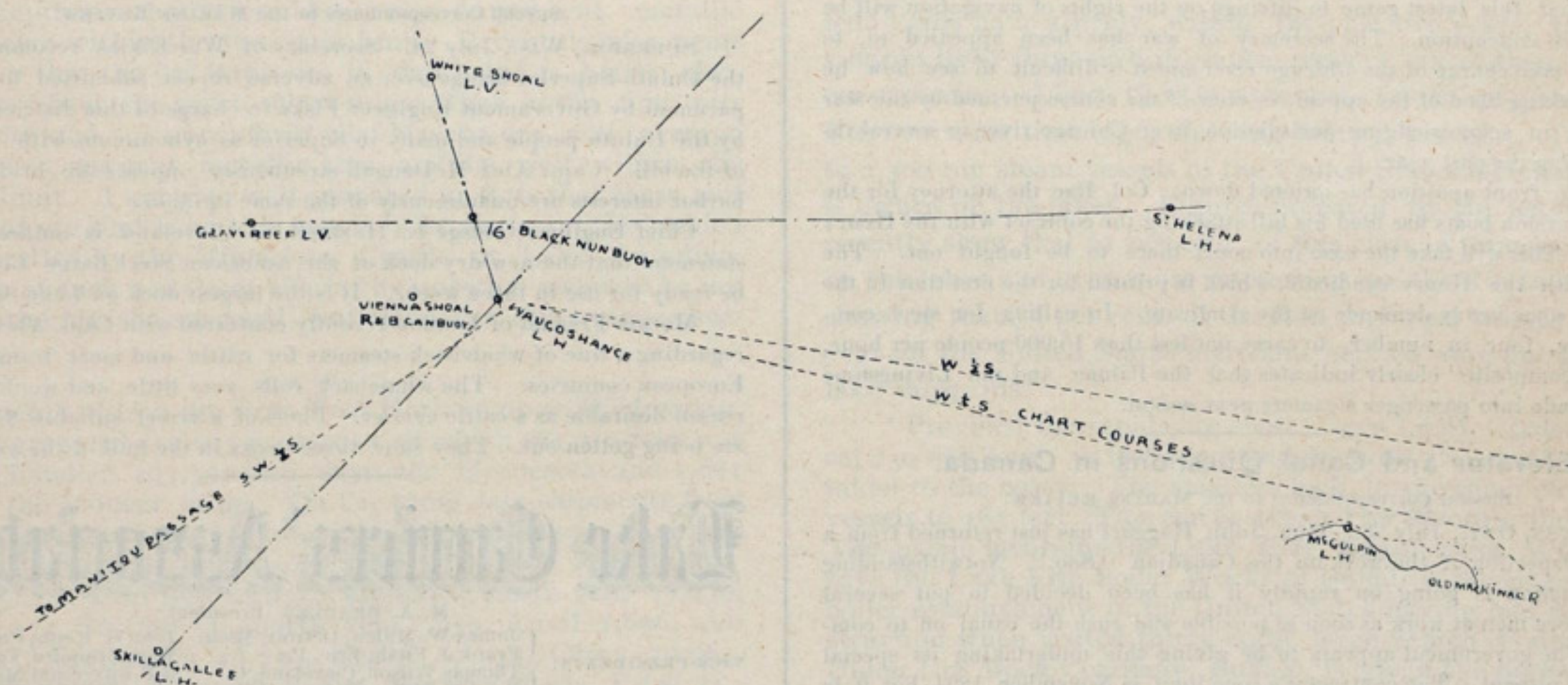
No. 4.

New Shoal in the Straits.

Another dangerous obstruction in the Straits of Mackinac has been located and buoyed by Commander Nicoll Ludlow, inspector of the ninth light-house district. The accompanying engraving, in connection with the official notice to mariners, will serve to show the location of the spot. The engraving is on a scale half the size of the regular government chart scale, and will be of some assistance in showing the position of the buoy marking the new shoal in relation to prominent lights in the vicinity. The official notice to mariners says:

"A small shoal, gravel and boulders, has been found 900 yards west, $\frac{3}{8}$ south of the Waugoshance 18-foot shoal buoy. The least depth of water over this shoal is 15 feet 10 inches. A second class nun buoy, painted black, has been placed in 23 feet of water, 15 yards northwest of the shoal. The position of the buoy is as follows: Waugoshance light-house S. S. E., $1\frac{1}{2}$ miles; St. Helena light-house, E. N. E. $\frac{1}{2}$ E., $12\frac{1}{4}$ miles; White shoal light vessel, N. N. W., $2\frac{1}{2}$ miles;

some light on this subject. The Mitchell's engines are 20, 32 and 52 by 42 inches, while the two boilers are 14 by $12\frac{1}{2}$ feet, allowed 160 pounds pressure. The Mitchell ran light from Fort Gratiot to Detour in 14 hours and 30 minutes. This run figured out shows a speed of over 15 miles an hour. The 15-mile boats on the lakes are scarce. Her regular speed with a Lake Superior load is $13\frac{1}{4}$ miles, and when desired 14 miles can be turned off. At the former speed she makes about 86 revolutions. Her two best cargoes are 2,757 gross tons from Escanaba and 2,313 gross tons from Lake Superior. Draught on the Escanaba load was 15 feet 11 inches forward and 16 feet 4 inches aft, while the mean draft with the Lake Superior load was 14 feet $4\frac{1}{2}$ inches. Since the boat came out she has not stopped once on account of heated machinery. Capt. Thomas Wilford says that as far as he can see she is a perfect steamboat, and Engineer Clancey says the machinery is all that could be asked for. The boat has a separate dining room for guests and her cabins are fitted to accommodate them. The capability of



LOCATION OF BLACK NUN BUOY, MARKING NEW SHOAL AT WAUGOSHANCE.

Gray's reef light-vessel, W. S. W. $\frac{1}{4}$ W., $3\frac{3}{8}$ miles. The buoy is on a line between Waugoshance light-house and White shoal light vessel, and nearly on a line between St. Helena light-house and Gray's reef light vessel. These ranges should be useful in turning this buoy at night. The red and black nun buoy on the 18-foot shoal has been removed."

Cargo Steamer Samuel Mitchell.

The subject of the supplemental illustration in the REVIEW this week is one of the most remarkable ore carriers that has come out with this year's fleet. The Samuel Mitchell, built by the Globe Iron Works Company for parties connected with the Cleveland Rolling Mill Company, Samuel Mitchell managing owner, has been described in the REVIEW. Her hull is from the same model as the Republic and Castalia, while her engines are four inches smaller and the boiler power somewhat greater. The relative size of engine as compared with size of boiler, is a highly interesting question, on which lake ship builders hold widely different views. Data from the tests of Mitchell's engines in comparison with similar data from the Republic might give

the boat in this line was tested on the last trip by Mr. William Chisholm, Mrs. Chisholm, their son and daughter and a party of eleven friends including Miss Brice, daughter of Senator Brice.

Commerce of Canadian Canals.

The "Canal Supplement" to the annual report of the Canadian department of railways and canals for 1891 will be issued shortly. The report will show that during 1891 the refund of tolls upon grain going through the Welland canal bound for Montreal amounted to \$49,834, being at the rate of 18 cents a ton upon 276,861 tons of grain. That the rebate has undoubtedly tended to encourage grain shipments to Europe by way of the St. Lawrence canals and Montreal is shown by these figures: Grain and peas passed down the whole length of the St. Lawrence canals for 1890, amounted to 242,571 tons; for 1891 to 320,434 tons, an increase of 77,863 tons or 32 per cent. The total quantity of freight passed through the Welland canal was 945,239 tons, against 978,692 tons in 1890. Of this United States vessels carried 646,683 tons, while Canadian vessels carried 298,556 tons.

CHICAGO LAKE INTERESTS.

WESTERN OFFICE, MARINE REVIEW,
No. 13 Western Union Building, CHICAGO, ILL., July 28.

The statement from Ashland that the wrecking expedition on the Emerald located the wreck of the Pewabic in 145 feet of water, but the steamer was so broken up that she was not worth raising, shows what time will do. When the Emerald returned to Alpena after her long search for the Pewabic it was given out that no trace of the missing boat had been found. The expert diver of the expedition gives it as his opinion that the Pewabic had not been located a year ago at all. In the trip from Alpena to Ashland it seems that the Pewabic was found in 145 feet of water. If the Emerald had continued on her way to Duluth there is no telling what might have happened. As a matter of fact, the Emerald was probably somewhat ashamed of the long search which resulted in nothing, and like the boy whose shirt was wrong side out had to have some excuse for the people when he got home.

The same old fight with the city of Chicago which began with the Canal street bridge, is now on again in relation to South Halstead street bridge. The position of the marine interest is entirely reasonable. The river at South Halstead street is very narrow at best. The people on that thoroughfare, which is the main artery of trade on the southwest side, are demanding a double-track bridge the full width of the street. This is what they ought to have. In order to construct a double-track bridge, it will be necessary to condemn land for widening of the river. The city proposes to go on and construct the bridge and secure the land afterwards. The marine men insist that the land must be first secured before the bridge is constructed. They say, with the best of reason, that condemnation proceedings are very slow and that if they permit the bridge to be constructed first it is most likely the river never will be widened. They have waited twenty years for land to be condemned at Eighteenth street. At Canal street the land which the city promised to secure for widening of the river has not and never will be secured. The marine interests are determined that they will not be again buncoed by promises on the part of the city officials. With the club of the war department it is likely that this latest game to infringe on the rights of navigation will be stopped in its conception. The secretary of war has been appealed to, to formally to take charge of the Chicago river and it is difficult to see how he can avoid taking heed of the appeal, in view of the course pursued by the war department in acknowledging jurisdiction over Chicago river in several instances during the past year.

The lake front question has quieted down. Col. Rae the attorney for the outside excursion boats has filed his bill attacking the contract with the Henry syndicate. This will take the case into court there to be fought out. The contract with the Henry syndicate, which is printed for the first time in the bill, makes some heavy demands on the syndicate. In calling for steel composite boats, four in number, to carry not less than 15,000 people per hour, the word "composite" clearly indicates that the Palmer and the Livingstone are to be made into passenger steamers next season.

Elevator and Canal Questions in Canada.

Special Correspondence to the MARINE REVIEW.

KINGSTON, ONT., July 28.—Hon. John Haggart has just returned from a thorough inspection of the work on the Canadian "Soo." Notwithstanding that construction is going on rapidly it has been decided to put several hundred more men at work as soon as possible and rush the canal on to completion. The government appears to be giving this undertaking its special attention at present. The contractor's time limit is November, 1894, but it is thought the work will be done before that.

Hugh McLellan, president of the Montreal Transportation Company, and an expert from Chicago have been here for some days in connection with the elevator scheme. The expert went over the water front in search of a suitable site and concluded that the property known as the Tete du Pont barracks, now occupied by the regular soldiers, would answer the purpose. The government will be asked for the premises mentioned and the city of Kingston for a bonus of \$50,000. The rest of the funds will be supplied by the Montreal Transportation Company, and the elevator will be a public institution. The probabilities are that work will be commenced in September.

The customs officer at Alexandria Bay compelled the captain of the mail steamer Corinthian to take back to Canada four laborers and to pay their expenses while under arrest. The captain said he did not know the men were under contract when he landed them. He paid the bill, however, and informed the officer that the steamer would not call again at the port. A director of the steamboat company was appealed to by outsiders, but he said the boat had made its last call at the place mentioned.

Leading Canadian papers are now discussing little but the canal tolls question, and all seem to doubt that the president will sign the bill. Already means of meeting the case are spoken of. A prominent member of the Montreal board of trade suggests that if a duty of \$2 per ton were levied upon Canadian shipping going through the Sault Ste. Marie canal, the Canadian government should recoup the owners. Of course such a scheme might last for part of a season, but it could not prove permanent. The vessels that would suffer most would be the steamers owned by the Canadian Pacific Railway. Mr. Wm. Stewart, managing director of the Kingston & Montreal

Forwarding Company, claims credit for having brought the matter to a head. He says that if the Canadian government had acted fairly in the Ogdensburg matter there would have been no agitation now.

Washington News Matters.

Special Correspondence to the MARINE REVIEW.

WASHINGTON, D. C., July 28.—Representative Blount, the chairman of the house committee on foreign affairs, says in a report on the bill authorizing the president to retaliate upon Canada for her discrimination against American shipping on the lakes that all efforts to secure a just interpretation of the treaty rights of American citizens have been met in a spirit of evasion, avoidance and delay; and, further, such conduct is not only dishonest in purpose and deceitful in method, but almost reaches to the point of contumely and insult.

John Baker Roach and William Futhey McPherson, as executors of the will of John Roach, of Chester, Pa., shipbuilder, have entered suit in the court of claims against the United States to recover \$204,428, amounts alleged to be due and unpaid for building the United States steamers Atlanta, Chicago and Boston. All these vessels were contracted for while W. E. Chandler was secretary of the navy, and the amounts claimed as due properly accrued because of change of plans and specifications in the vessels by the secretary of the navy.

United States Consul Plumacher at Maracaibo, Venezuela, informs the state department that a new steel stern wheel steamer has recently arrived from the United States in sections, to be put together at Maracaibo. He expresses the opinion that no doubt others will follow until finally all river transportation in that country will be carried on by steam vessels. He says: "It is gratifying to know that all these will be ordered from the United States, as the superiority of our hulls and engines has been so clearly demonstrated. No one now thinks of placing an order of this kind in Europe."

Duluth Superior Bridge Question.

Special Correspondence to the MARINE REVIEW.

SUPERIOR, WIS., July 28.—Secretary of War Elkins' recommendation of the Duluth-Superior bridge over an adverse report submitted to the war department by Government Engineer Fiske in charge of this district is accepted by the Duluth people and many in Superior as synonymous with the passage of the bill. Capt. Alex McDougall strenuously opposes the bridge and the harbor interests are unanimously of the same opinion.

Chief Engineer George E. Hartnell of Cleveland is authority for the statement that the new dry dock of the American Steel Barge Company will be ready for use in three weeks. It is the largest dock on Lake Superior.

Morton Freman of London recently conferred with Capt. Alex McDougall regarding a line of whaleback steamers for cattle and meat transportation to European countries. The whaleback rolls very little and would be for that reason desirable as a cattle carrier. Plans of a vessel suitable for that trade are being gotten out. They show three decks in the hull of the vessel.

Lake Carriers' Association.

M. A. BRADLEY, President.

VICE-PRESIDENTS: James W. Millen, Detroit, Mich. John G. Keith, Chicago, Ill.
Frank J. Firth, Erie, Pa. W. S. Brainard, Toledo, O.
Thomas Wilson, Cleveland, O. R. P. Fitzgerald, Milwaukee, Wis.
Peter F. Miller, Buffalo, N.Y. Alex. McDougall, Duluth, Minn.
Charles H. Keep, Secretary, Buffalo, N.Y. Geo. P. McKay, Treasurer, Cleveland, O.
Harvey D. Goulder, Counsel, Cleveland, O.

At a meeting of the finance committee in Cleveland, Monday the following was adopted:

"Resolved that the secretary be and he is instructed to send a communication to the secretary of war calling attention to the proposed erection of a bridge across St. Louis bay, or St. Louis river, from Rice's point to Connor's point, or in that locality, and requesting that necessary action be taken by the department to prevent the erection there of any unreasonable impediment or obstruction to navigation."

Capt. George P. McKay, secretary of the committee sent on to Washington a protest in accordance with the resolution. Municipal authorities in Duluth seem to be over-reaching authority in the several bridge schemes which they have on hand. They talk of going ahead with a bridge over the canal entrance to Duluth and Superior harbors, notwithstanding the ruling of the war department in the matter.

The editor of the MARINE REVIEW has examined Patterson's Nautical Dictionary thoroughly, and with pleasure recommends it to any one having any connection with marine affairs.

Record of Speed and Big Cargoes.

[Masters or owners are invited to report improvements on this list.]

Iron ore: Lake Michigan—Maryland, Inter-Ocean Transportation Company of Milwaukee, 3,507 gross, or 3,944 net tons, Escanaba to South Chicago; Western Reserve, Peter Minch of Cleveland, 3,314 gross, or 3,717 net tons, Escanaba to Ashtabula.

Grain: E. C. Pope, Eddy Bros. of Bay City, 125,730 bushels of corn, Chicago to Buffalo, draft 14 feet 8 inches; Western Reserve, Peter Minch of Cleveland, 112,431 bushels of wheat, Chicago to Buffalo; W. H. Gilcher, J. C. Gilchrist of Cleveland, 114,982 bushels of corn, Chicago to Buffalo.

Speed: Owego, Union Line of Buffalo, Buffalo to Chicago, 889 miles, 54 hours and 16 minutes, 16.4 miles an hour; Saranac, Lehigh Valley Line of Buffalo, Buffalo to Lime-Kilns, 240 miles, 15 hours and 10 minutes, 16 miles an hour.

Iron Mining.

VALUE OF LEADING STOCKS.

Quoted by Chas. H. Potter & Co., No. 104 Superior St. Cleveland, O.

Stocks.	Par Value.	Bid.	Asked.
Cleveland-Cliffs Iron Company.....	\$100 00	\$.....	\$ 75 00
Champion Iron Company.....	25 00	.....	60 00
Chandler Iron Company.....	25 00	42 00	45 00
Jackson Iron Company.....	25 00	.....	100 00
Lake Superior Iron Company.....	25 00	43 00	45 00
Minnesota Iron Company.....	100 00	73 50	80 00
Pittsburgh & Lake Angeline Iron Co.....	25 00	.....	145 00
Republic Iron Company.....	25 00	.....	17 00
Ashland	25 00	.....	.....
Section Thirty-three.....	25 00	.....	7 50
Brotherton.....	25 00	2 00	2 50
Iron Belt.....	25 00	2 25	2 50
Aurora.....	25 00	8 25	.....

In a letter to the Iron Trade Review of Cleveland Horace V. Winchell says: "One word as to the quality of Mesaba ore. Some weeks ago I announced in the face of considerable criticism and skepticism that it would average 60 per cent. metallic iron and come within the Bessemer limit. Recent developments have shown that the ore improves in depth and is better, also, farther away from the green schist ridges than in the first pits that were located. I now affirm that Mesaba ore will average better than 63 per cent. metallic iron and be well within the Bessemer limit. I am also well prepared to state that there will be grades of ore sent from this range in large quantities which are not excelled by the Minnesota, Castile or Lake Angeline. In the face of such a state of affairs the question seems to be not 'How can the Mesaba succeed?' but 'How can other ranges survive.'"

Shipments of iron ore from Two Harbors up to Wednesday, July 20, aggregated 457,915 gross tons, of which 264,713 tons was from the Chandler, 191,521 tons from the Minnesota and 1,681 tons from the Pioneer mine. On the same date shipments from Ashland aggregated 926,539 tons, divided as follows: Ashland 86,818 tons, Aurora 143,890, Colby No. 2 25,836, Rand, 4,502, Tilden 115,206, Iron Belt 61,671, Montreal, north vein 17,239, Palms 26,171, Section 33, north vein 2,259, Anvil 1,696, Albany 1,025, Brotherton 46,239, Comet 10,574, Carey 10,064, East Norrie 92,646, Newport 40,844, Norrie 178,623, Pabst 21,760, Sunday Lake 31,101, Windsor 8,375.

The Commonwealth Iron Company has shipped about 100,000 tons of ore from the Badger mine. When cars are plentiful, the shipments easily average 1,700 tons a day, but of late there has been a scarcity of cars and the daily shipments have dropped to something less than 1,500 tons. The company sold 169,000 tons of ore early last spring, and additional sales are anticipated before the close of the shipping season. The company's two explorations, near the Badger and Davidson, continue to look good, and the prospects for the development of two new mines are considered most excellent.—Florence News.

The nineteenth annual report of Minnesota's state geologist, N. H. Winchell of Minneapolis, has been received. It contains the natural history and geological survey of Minnesota, and also the elements of a new method of chemico-microscopic analysis of rocks and minerals by Boricky.

The Country's Production of Pig Iron.

Some interesting figures on production of pig iron have just been given out by the American Iron and Steel Association. The bulletin of the association says: "The total production in the United States in the first half of 1892 was 4,799,056 gross tons, against 4,911,763 tons in the second half of 1891, a decrease of

112,707 tons. Adding the production of the two half years, we have the extraordinary production of 9,710,819 gross tons in twelve months, which is 508,116 tons in excess of the production of 9,202,703 tons in 1890. Our production of pig iron in the twelve months of 1891 fell below that of 1890 because of the serious interruption to the furnace activity in the first part of 1891, when we made only 3,368,107 gross tons, the total production in that year being 8,279,870 gross tons."

"Much has been said in trade journals during the past few months of the necessity for blowing out furnaces that production may be decreased. Our statistics show that there were 313 furnaces in blast on the 31st of December last, and 279 on the 31st of March last, a decrease of thirty-four active furnaces in three months. On the 30th of June last there were 256 furnaces in blast, showing a further decrease of twenty-three active furnaces in three months, or fifty-seven in all since the close of 1891. On the 30th of June, 1891, there were 294 furnaces in blast. The number of active furnaces in the first half of 1892 has been much smaller than in the second half of 1891, and yet the smaller number produced almost as much pig iron as the larger number."

Lake Ship Building and Commerce.

"Ship Building on the Great Lakes" is the subject of an article in a recent number of Harper's Weekly. The writer, Lieut. Godfrey L. Carden, U. S. R. M., made a brief visit to lake ship building concerns last fall, for the purpose of determining whether they were capable of turning out war ships. If his report is as complimentary as his article the impression created in the navy department must be at least favorable to affording inland yards every opportunity to compete in the work of building a new navy. Cleveland, Detroit, West Bay City and Toledo yards have already, within the past two years, turned out a dozen light-ships or light-house tenders, six of them being for coast service. Lieut. Carden uses some figures prepared by the REVIEW some time ago, showing that 57 per cent. of the 1,000 to 2,500 ton steam vessels of the United States merchant marine is owned on the lakes. Figures prepared by the REVIEW more recently show that 61 per cent. of this class of tonnage is owned on the lakes, and even more interesting are the REVIEW's figures showing that 55 per cent. of the iron and steel vessels built last year for the United States merchant service were put forth from lake shipyards.

"Provided the rapids are shot," says Lieut. Carden, "a vessel 230 feet long, 39 feet beam and drawing 12 to 14 feet, can be taken to the coast. The smallest lock in the canal chain limits vessels to 183 feet. This can be avoided by shooting the rapids." The article mentions the Lake Erie Engineering Works, and says the Lake Erie Boiler Works of Buffalo is the largest marine boiler establishment in the United States, having had under construction when visited thirty-eight large Scotch boilers. The Union Dry Dock Company, Buffalo, is given the honor of being the oldest yard on the lakes. With a description of the Chicago Ship Building Company he mentions that Manager Babcock was connected with the Roach establishment when the cruisers Chicago, Boston, Atlanta and Dolphin were built. The E. P. Allis Company, Milwaukee, the writer says is in the first rank of machinery producing plants. F. W. Wheeler & Co.'s 2,000 feet frontage is mentioned as the longest in the country. Wickes Brothers plant at Saginaw is also favorably noticed. The great ship building center of the great lakes, is the title accorded to Cleveland. The article contains a number of inaccuracies, the greatest of which is passing the Detroit Dry Dock Company with mere mention.

The statistical figures on lake marine prepared by the REVIEW, have, through being widely copied, attracted attention of magazine editors to the lakes. Another article, "Our Empire on the Lakes" in the July number of the Illustrated American, contains information and illustrations of lake ports. It is stated that all the alkali plains in the west were beds of great lakes at one time. Coming down to the present the writer claims that Lake Superior has a lunar tidal wave of three inches. Notwithstanding the latter statement vessel masters will hardly figure on it in taking on cargo.

SEND 50 CENTS IN STAMPS TO THE MARINE REVIEW FOR TEN PHOTOTYPES AND GRAVURES OF LAKE STEAMERS NEATLY BOUND.

Headquarters of Cleveland Shipping Interests.

Only a few years ago the idea prevailed among business men that the farther they were separated from competitors—within the business portion of a city, of course—the better it was for them from a business view. Now the opposite is the case in the large cities. Cleveland and its marine interests are no exception to this new order of things. In the Perry-Payne building on Superior street, between Water and Bank streets,



PERRY-PAYNE BUILDING, CLEVELAND, OHIO.

are located nearly all of the leading vessel owners, vessel brokers and shippers of coal and iron ore. Two or three other large business blocks contain a few of the firms and individuals engaged in these lines of trade, but none of them are more than a stone's throw from this central headquarters. A very large share of Cleveland's prosperity as a city is due to its lake interests, and the aggregate amount of money involved in even a day's transaction in this one building, especially during the period when season contracts with vessel owners for the transportation of coal and iron ore are under way, would make a most surprising showing. The MARINE REVIEW occupies humble quarters in this center of business activity.

Iron Ore, Grain and Lake Freight Matters.

Some figures regarding stocks of pig iron in the country on July 1, as compiled by the Western Association of Pig Iron Dealers, have been made public, and although a reduction of stocks of coke iron during June of over 9,000 tons is reported, the market can hardly be said to show any improvement, as prices are still at the lowest range for some time past, and the shutting down of mills consuming iron, while the furnaces keep on producing, will have a tendency to make an increase for the present month. Stocks of coke iron are, however, full 25,000 tons less than they were on April 1 last, but they are still heavy enough to warrant the opinion that unless there is early improvement in the iron market shipments of iron ore from the Lake Superior district will be confined largely to covering sales, and the movement of unsold ore restricted even more, probably, than it has been so far in the season.

A continuance of present conditions in the iron trade is, therefore, a bar to any boom in fall freights, but the movement of grain and coal continues sufficiently large to cause slight advances instead of a decline in the general lake freight market. On this account iron ore shippers have not moved more than 75 per cent. of the ore that would have been brought to Lake Erie ports if freights had been lower. This is especially true of

shippers moving ore from Escanaba. They do not complain of freight rates being exorbitant, as the range on both grain and ore is, of course, only moderately profitable, but they can not take chances in assuming the expense of carrying large quantities of an unsold product. As there is nothing definite regarding the movement of new grain crops, all opinions regarding freights for the latter half of the season are purely speculative.

Soft coal shipments to the head of Lake Superior were restricted a little early in the week, but the supply is again increased somewhat and there is still every assurance that the coal movement throughout the season will give vessels more than the usual share of employment derived from that trade. Freights on both hard and soft coal are strong at the rates that have ruled for more than a month past. Iron ore freights are \$1.15 from Two Harbors and Ashland to Ohio ports; \$1.10 from the same ports to South Chicago; \$1.00 from Marquette to Ohio ports and 75 cents from Escanaba to Ohio ports.

Cargo Steamer 377 Feet Over All.

Although the announcement last week that F. W. Wheeler & Co. of West Bay City, Mich., would build a steel steamer for the Hawgood & Avery Transit Company of Cleveland was a little premature, the contract has since been closed and the boat will be by great odds the largest vessel on the lakes. Her dimensions are: Keel 360 feet, over all 377.6 feet, beam 45 feet, moulded depth 25 feet. The latest steamers of the Minnesota Iron Company are only 350 feet over all and the straightback under way at the Wyandotte yard of the Detroit Dry Dock Company, is but 342 feet keel. The water bottom in this latest lake leviathan will be 54 inches and the total water bottom capacity 1,400 tons. She will be built after the regular model of Wheeler steel steamers, and will have nine working hatches, turtleback forward and three pole spars. Her engines will be of the triple expansion type, with cylinders 23, 35 and 62x44 inches stroke. The boilers, two of them, will be 12½ feet in diameter by 12 feet long. Neither owners nor builders are making any claims regarding the capacity of the boat. Her dimensions are enough to warrant the belief that she will lead all cargo carriers for some time to come. She is to be out on April 1 next.

Years of High Freights.

Just twenty years ago, in 1871, vessel owners reaped a harvest in high freights on the lakes. The steamer Raleigh, built by Quayle & Martin for the Winslows of Cleveland, went into commission in that year and was run regularly for the whole season between Chicago and Buffalo, on freights varying from 13 to 16 cents a bushel. In the following fall she was chartered for three seasons, ore from Marquette to Cleveland, at \$3.50, \$3.25 and \$3.00 a ton, respectively, for the different years. Other boats of the Raleigh's class, then a large carrier on the lakes, were accorded the same advantages, and shippers offered these three-year contracts to anyone who could secure capital for the building of a boat. Some of the big individual fleets of today were built up along about this time. During two or three years following, the late Capt. Alva Bradly built such boats as the Selah Chamberlain, E.B. Hale and others. A few of the larger boats of the Minch fleet were also built from profits secured in prosperous seasons following 1872.

Grain at Chicago and Duluth.

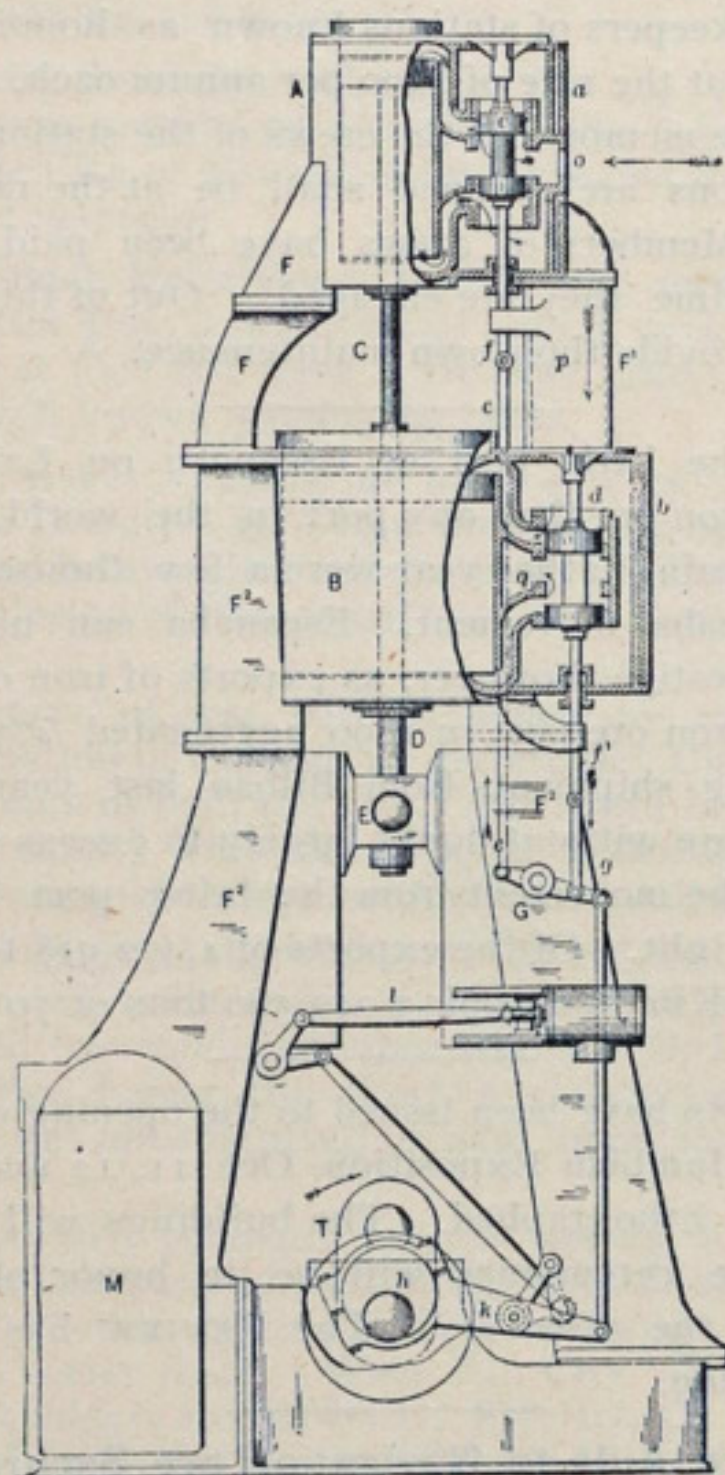
Stocks of grain at Chicago and Duluth on Monday, July 25, were as follows:

	Chicago.		Duluth.
	Wheat, bu.	Corn, bu.	All wheat, bu.
In store.....	4,399,446	3,911,156	3,362,000
Decrease last week.....	163,225	207,347	31,000

In addition to the above there was in Chicago on the same date 1,555,362 bushels of oats, 100,858 bushels of rye and 24,982 bushels of barley.

Compound Engine Designed by Horace See.

Horace See, naval architect of No. 1 Broadway, New York, is well known to designers of vessels and machinery on the lakes. He presents a new design of compound engine in which the object aimed at is to simplify the arrangement of the actuating valves for the cylinders and the valve motions operating the valves. The drawing is a side elevation of a vertical compound tandem engine, the steam chests being shown in vertical cross section. The letter A indicates the high pressure cylinder, B the low-pressure cylinder, C and D the piston rod; the usual connecting rod between the cross head E and the crank T is omitted. The two cylinders are tied together by the top frames F and by the exhaust pipe F¹ which connects the two steam chests *ab*. The frames F² support the cylinders and all the upper parts. The piston valves *c d* are of the usual form, and their valve stems *f f*¹ are connected by rods *e g*, respectively, to arms secured on opposite sides of the rock shaft. To one end of this rock shaft or beam is attached a rod whose lower end is secured to the eccentric rod K, which is jointed in a usual way by a strap to the eccentric *h*, on the main shaft. This eccentric rod, between the eccentric and its outer end, is suspended by a link on a movable center, and connected by a system of rods and levers to a bell crank *m*, which is connected by one of its arms and the rod *l* to



SEE COMPOUND ENGINE.

the cross head of the reversing engine L. This reversing gear, thus arranged, represents what is known as the "radial" gear, or so called Marshall valve gear. It is obvious that, upon a reciprocating motion being imparted to the rod depending from the beam G, the latter will be caused to vibrate upon its center, thereby reciprocating the valves *c d*, the lower valve *d* rising as upper valve *c* descends and *vice versa*. The stem entering the upper steam chest through the nozzle *o*, will enter the cylinder through the center of the valve and escape at the ends of the valve, when it passes downward, as indicated by the arrow *p*, through the exhaust pipe F¹ into the steam chest *b*. It enters the low pressure cylinder from the ends of the valve, and is exhausted through the central portion of the valve as indicated by the arrow *q*. The exhaust steam pours around the cylinder B into the rear frame F², which, as a hollow column, serves to conduct the exhaust steam downwardly into the condenser M.

The following advantages are claimed for this construction: None of the packing in any of the valve-stem stuffing boxes is subjected to the high pressure of the steam coming direct from the boiler, but to only the pressure of the steam after having been at least once exhausted after doing work in a cylinder. This is due to the admission of the initial high-pressure steam

only in the interior of the valve of the high-pressure cylinder. The relative arrangements of the valves also are such that if the cylinders be set to operate vertically the weight of one valve tends to counterbalance the weight of the others.

The arrangement of steam chests is such that the exhaust pipe connecting them serves as a framing to support the upper cylinder or to tie the upper and lower cylinders together. This system has also the advantage of shortening the cylinder ports by reducing to a minimum the distance between each valve and its cylinder. The steam chests, being placed circumferentially out of line, not only permit the valve stem and valve rod, either or both, of the smaller cylinder to pass by the side of the steam chest of the larger cylinder, for the valve stem itself, if prolonged, will pass by the side, but dispense with more than one stuffing box on the steam chest of either cylinder and avoid the intervention and multiplication of long rock shafts and beams and rods to operate the valves.

Although the drawings show this system applied only to the double-cylinder compound type of engine, yet so accessible are all the parts, so devoid of complications the arrangement of valves, and so few the connections for actuating the same that the system can be readily extended to the triple-expansion engine with two or three cranks, as may be desired, or to the quadruple-expansion engine with cylinders of suitably increasing volumes, and with any suitable number of cranks that may be desired. The engraving is from the Iron Age.

Work of the Ship Yards.

The whaleback barge Sagamore, launched on Saturday at West Superior, is 320 feet long, 30 feet beam and 24 feet hold. The Sagamore is a consort of the big whaleback steamer Pathfinder, launched last week. They are the property of the Huron Barge Company of Cleveland, in which Mr. Samuel Mather is a leading stockholder.

The first of the new Anchor Line steamers to go into commission, the Codorus, built by the Union Dry Dock Company of Buffalo, was given a trial a few days ago, and the result was most satisfactory to both owners and builders. It is expected that package freight cargoes will be handled on the three new steamers of this line faster than on any boats on the lakes.

The H. W. Williams Transportation Company of South Haven is building a steamer for its South Haven and Chicago route. She will be 175 feet in length, 31 feet beam and 13 feet depth of hold. Henry Bloecker & Co. of Grand Haven will build the engine, which is to be 26x30 inches, condensing with independent pump. Steam will be furnished by a Scotch boiler, 11x11 feet, with three 36-inch furnaces. The boiler, to be built by Johnson Brothers, will be allowed 130 pounds pressure.

The light-house tender Lilac, built by the Globe Iron Works Company for service in the first light-house district, is on her way through the St. Lawrence canals. She left Cleveland July 16 in the evening, arrived at Ogdensburg July 19, and was hauled out on the marine railway to receive pontoons for the purpose of lightering her draft aft. She left Ogdensburg last Saturday and had passed the Cornwall canal Monday. Mr. Luther Allen, secretary of the Globe company, who accompanied the steamer on her trip down the St. Lawrence, writes that no attempt was made to speed the boat and that the engines worked perfectly.

J. B. Fairgrieve & Sons of Hamilton, Ont., are about to place in commission a new steel steamer for the Lake Superior grain trade. Her name is Arabian. She stuck on the ways on Thursday when ready for launching but this will probably not delay the builders in their plans for having her in service before Aug. 15. The boat is 180 feet over all, 172 feet on the water line, 14 feet depth of hold and thirty-one feet beam. She will draw fifteen feet of water when loaded, and will be able to carry 44,000 bushels of wheat without trouble. She is fitted out with compound engines of 500 horse-power. The cost of the Arabian will be about \$70,000.

Official Numbers and Tonnage.

The bureau of navigation, E. C. O'Brien commissioner, assigned official numbers to the following lake vessels during the week ending July 23: Steam—Mahoning, built at Wyandotte, Mich., and hailing from Erie, Pa., 2,184.03 tons gross, 1,744.77 net, No. 92,454; Desmond, built at Port Huron, Mich., and hailing from same port, 456.14 tons gross, 355.38 net, No. 157,350; Michael Brand, built at Chicago and hailing from same port, 34.33 tons gross, 20.61 net, No. 91,036. Sail—Rival, built at Milwaukee and hailing from Milwaukee, 11.42 tons gross, 10.86 net, No. 110,985.

MARINE REVIEW.

DEVOTED TO THE LAKE MARINE AND KINDRED INTERESTS.

JOHN M. MULROONEY, } PROPRIETORS.
F. M. BARTON, }
HOMER J. CARR, Associate Editor and Manager Chicago Office,
Western Union Building, 110 LaSalle Street.

Published every Thursday at No. 516 Perry-Payne Building, Cleveland, O.

SUBSCRIPTION—\$2.00 per year in advance. Convenient binders sent, post paid, 75 cents. Advertising rates on application.

The books of the United States treasury department contain the names of 3,600 vessels, measuring 1,154,870.38 tons in the lake trade. In classification of this fleet the lakes have more steamboats of 1,000 to 2,500 tons than the combined ownership of this class of vessels in all other sections of the country. The number of vessels of 1,000 to 2,500 tons on the lakes on June 30, 1891, was 310 and their aggregate gross tonnage 512,787.58; in all other parts of the country the number of this class of vessels was, on the same date, 213 and their gross tonnage 319,750.84. The classification of the entire lake fleet is as follows:

Class.	Number.	Tonnage.
Steam vessels	1,592	756,751.53
Sailing vessels.....	1,243	325,131.06
Canal boats.....	703	72,515.42
Barges.....	62	20,472.37
Total.....	3,600	1,154,870.38

Tonnage built on the lakes during the past five years, according to the reports of the United States commissioner of navigation, is as follows:

	No. of boats.	Net Tonnage.
1887.....	152	56,488.32
1888.....	222	101,102.87
1889.....	225	107,080.30
1890.....	218	108,515.00
1891.....	204	111,856.45
Total.....	1,021	485,042.94

St. Mary's Falls and Suez canal traffic: Number of boats through St. Mary's Falls canal in 1890, 228 days of navigation, 10,557; tonnage, net registered, 8,454,435. Number of boats through Suez canal during 1890, full year, 3,389; tonnage, net registered, 6,890,014. Number of boats through St. Mary's Falls canal in 1891, 225 days of navigation, 10,191; tonnage, net registered, 8,400,685. Number of boats through Suez canal during 1891, full year, 4,207; tonnage, net registered, 8,698,777.

Entered at Cleveland Post Office as Second-class Mail Matter.

IN connection with the canal toll question a great deal of idle talk is being indulged in about Canada hurrying to completion the new canal at Sault Ste. Marie, Ont., "when the country will then have an uninterrupted waterway in its own territory, from Lake Superior through to the Atlantic." The St. Clair Flats canal, built by the United States, and the cut at the Lime Kilns, completed only recently from funds obtained through the regular river and harbor appropriations of the United States government, are put down as American improvements in Canadian waters. It will be noticed, however, that such claims are made only in Canadian newspapers that have given no investigation to the subject. They are not made by the government authorities of Canada, and there is really no need of reference to them in connection with the canal tolls question, as the Canadian officials must see their error on this subject and bring about a settlement before even the retaliatory measure at the St. Mary's Falls canal goes into effect. It is held by the best authorities in the war department that the St. Clair canal is entirely within the waters of the United States, and only a small corner of the cut at the Lime-Kilns extends into the waters of Canada. It must be admitted that a very large portion of the Detroit river channel below the Lime-Kilns is entirely in Canadian waters, but no one expects that the present controversy will go so far as to bring about any extreme measures governing the commerce of these waterways.

"THE drum of campaign is abroad in the states," is the answer of Canadian newspapers to the firm stand taken by President Harrison on the subject of discrimination against Canadian commerce passing through the Welland and St. Lawrence canals. This is strange logic in consideration of the fact that

the bill proposing retaliation was passed unanimously by both houses, notwithstanding the very large Democratic majority in the lower house of congress. The Canadians interested in this subject have just learned that Ogdensburg grain interests have been most active in bringing the matter to the attention of the United States government. Was it not the Kingston grain forwarders, competitors of citizens of the United States in the same business at Ogdensburg, who secured through influence with the late premier, John Macdonald, the first issuance of the order-in-council that has brought about the present difficulty?

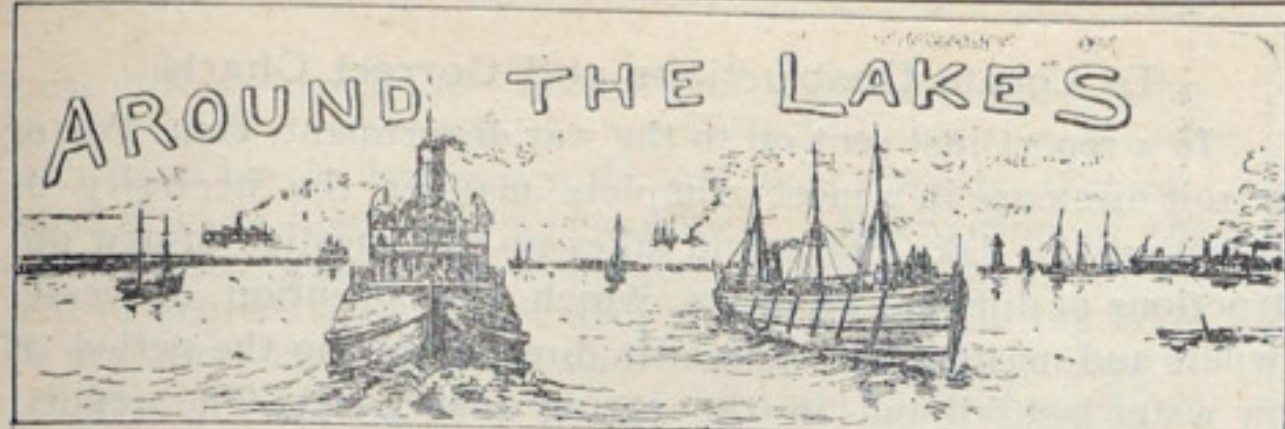
AT LAST both houses of congress have passed the bill increasing the pay of the deserving heroes of the life-saving service. The increase was not as large as was desired by the friends of the life savers in the house, but delay in an attempt to pass a new measure, notwithstanding the justice of such an act, might have jeopardized the chances of any bill being passed during the present session. As the bill goes to the president it provides that hereafter the compensation of the keepers of life-saving stations shall be at the rate of \$900 per annum each, except that of keepers of stations known as houses of refuge, which shall be at the rate of \$600 per annum each, and the compensation of the members of the crews of the stations during the time the stations are manned shall be at the rate of \$65 per month each. Members of crews have been paid only \$50 a month for the time they are engaged. Out of this meager pay they have to provide their own maintenance.

IN 1889 the little port of Escanaba on Lake Michigan shipped more iron ore than any port in the world. Shipments from Bilbao, Spain, in that year were a few thousand tons behind the Escanaba movement. Escanaba can no longer lay claim to this prestige, however, as exports of iron ore from the great Spanish iron ore port in 1890 aggregated 4,372,918 tons. Figures showing shipments from Bilbao last year are not at hand but they are without doubt largely in excess of Escanaba shipments, as the movement from the latter port in 1891 was comparatively light. Of the exports of 4,372,918 tons from Bilbao the United Kingdom took 3,040,560 tons or 70 per cent.

INVITATIONS have been issued to the opening ceremonies of the World's Columbian Exposition, Oct. 11, 12 and 13. They are handsomely lithographed. The buildings will not be finished, but the ceremonies will be in honor of the 400th anniversary of the discovery. The REVIEW has been favored with an invitation.

A Few Aids to Navigation are Secured.

Again the senate and house conferees on the sundry civil appropriation bill have inserted the few items for aids to navigation on the lakes and there is reasonable assurance that the bill when finally reported will be passed. The only item included in the bill when first reported from the conference committee but left out in the final report, is an appropriation of \$95,000 for a tender for the Ninth light-house district. The bill now provides for a fog signal, Buffalo breakwater, \$4,300; upper range lights, St. Mary's river, \$5,000; Frankfort pier head fog bell, Lake Michigan, \$1,000; two light-ships at northwest and southwest corners of Lime-Kilns crossing, \$1,000; range lights above Grassy island, Detroit river, \$1,500; three small light vessels for use in Detroit river, \$8,600; range light for Mamajuda island, \$1,500; range lights on Grosse isle to center the channel from the foot of Fighting island to Mamajuda light, \$2,500; a government light-ship at Bar point, Lake Erie, \$25,000; Superior bay lights, Wisconsin, \$1,200. Sixty thousand dollars already appropriated for establishing a light station on or near Eleven-Foot shoal, is applied for the construction of one or more light-ships for use on the great lakes.



Acme is the name by which the lake tug Music will be known hereafter. She was rebuilt at Bay City.

Capt. L. D. Bennett has sold a two-thirds interest in the barge J. C. King to Capt. Latour, who will command her.

Capt. Samuel Butman, of Lorain has purchased the schooner Smith & Post from the estate of the late Capt. G. E. Mapes, Detroit, for \$1,800.

Lumber handlers are also seeking records in the work of rapid loading. At Muskegon a few days ago 250,000 feet of lumber was placed on board the steamer M. C. Neff, in five and one-half hours.

On one of her recent trips, according to data furnished by Chief Engineer Elliot of the Goodrich Line the steamer Virginia averaged 19 miles an hour for four hours, carrying 150 pounds of steam and making 128 turns.

Capt. Burns, formerly in charge of the tug Washburn, and whose license was revoked on account of the collision between the tug and the City of Mackinac, has appealed from the decision of the local inspector.

Capt. Jeremiah McCarthy of Buffalo who owned and commanded the Plow Boy, a small vessel used in wrecking and junk business, died at Erie last week. He was sixty-four years of age and was well known around the lakes.

George C. Baker's submarine boat will be given another trial shortly in Detroit. It is now proposed to operate the boat above as well as below water by electricity. Repairs necessitated by the explosion of storage battery cells aboard the boat are being made.

The secretary of war will be asked by the Lake Line Agents' Association of Chicago to declare the Chicago river to the extreme limits of both the north and south branches under the war department. This step is taken to defeat the construction of an objectionable bridge at South Halsted street.

It is again reported that the Lake Michigan and Lake Superior Transportation Company (Leopold & Austrian of Chicago) will build two steel passenger steamers during the coming winter for service during the World's Columbian Exposition. This company has been figuring on new boats for two or three years past.

An incorporated company, to be known as the Stewart Transportation Company of Detroit has been formed by the owners of the new wooden steamer C. F. Bieleman, which will soon leave F. W. Wheeler & Co.'s West Bay City ship yard. The principal stockholders are Albert E. Stewart, C. F. Bieleman, George Peck, John J. Barlum and George H. Leshner.

In loading a cargo of 103,000 bushels of wheat at Duluth Tuesday, the new steel steamer Gilbert, built by F. W. Wheeler & Co. of West Bay City comes very close to the largest cargo of grain ever taken from Lake Superior. The steamer Pope's cargo on high water last season was but about 1,000 bushels better than that just taken by the Gilbert. The latter will undoubtedly improve upon her first loads.

Oswego's new elevator, to be built by the New York, Ontario & Western Railway, will be of iron and steel and will have a capacity of from 250,000 to 400,000 bushels. Its cost is estimated at from \$250,000 to \$500,000. It will have 16 feet of water at its docks and will be equipped with two legs, each having an elevating capacity of 10,000 bushels an hour, and will be built with a number of car tracks running under, so that from twelve to eighteen freight cars can be loaded simultaneously.

July 26, 1891, the steamer City of Berlin was badly damaged at the entrance to the Sault canal by a collision with the schooner E. A. Nicholson, which was in tow of the steamer J. Emory Owen. Both steamer and schooner were subsequently libeled for \$2,000. The case was heard before Judge Swan in the United States circuit court at Detroit, and he held both to blame for the collision. The case was then referred to a commissioner to assess damages.

Capt. Chris. Smith of the lake tug Sumner has again covered himself with glory. He had a very serious time of it on Saginaw bay during the gale of last week, when several rafts were lost. The Sumner put out two anchors, faced the wind and sea, worked her engine to the utmost and saved a raft of 2,500,000 feet from going ashore about three miles from the beach west of Port Austin reef. The raft dragged for about 20 miles, but the property was saved and landed at Sand Beach.

Of course the story of a note being found from one Patrick McCarty, who proclaimed himself a member of the ill-fated crew of the schooner Finney, lost with all hands on Lake Erie last fall, was a fake. Officers of the Seamen's Union, who had a record of the members of the Finney's crew, say there was no Patrick McCarty among them. The idea of a man being intelligent enough to write a note asking that his wife be informed of his fate and then give his residence as "Michigan" was absurd on the face of it. It was simply a bottle yarn, to which no publicity should have been given.

A life-boat described in the last issue of the REVIEW was the Dobbins boat, which is in use at every station in the Ninth district on the lakes. It is also being adopted at other lake stations, three having been recently completed in Buffalo for stations at Holland, Michigan City and Grand Haven. It has replaced the Beebe boat on the lakes and also on the coast, a Dobbins boat being shipped to California last year. The boat proved so successful that the superintendent of the coast service induced the patentee to permit coast boat builders to manufacture the boat by paying a royalty. Hence the boat that is attracting so much attention on the coast is the same as those in use on the lakes. Capt. Dobbins is building a life dinghy for the Cleveland station.

An Old-Time Marine Temperance Society.

A few old-time lake-faring men will remember that there was formed over a half a century ago the Cleveland Marine Total Abstinence Society, July 6, 1840, being the date of its inauguration. The first officers were: J. G. McCurdy, president; A. Holmes, Capt. Wm. Lacey and J. Proudfoot, vice-presidents; J. W. Hall, secretary. A committee consisted of Capt. Guyles, D. McIntosh, Mr. Downie and J. Turnbull. In 1854, when the last record of the society appears, over 8,000 persons had signed the pledge and had their names added to the roll "on the windlass." Judging from this and the fact of the names of nearly all the schooners on the lakes in those days being represented by the master, mate, seaman or cabin-boy signing their names, temperance must have been popular. Among the names are found schooners C. I. Marshall, Havre, Free Trader, Express, the Pacific, Wm. B. Guyles, master, and the schooner N. Biddle, D. P. Dobbins, master. The schooner Express was "dry," master and crew having pledged against red liquor, Michael Driscoll of the brig Toledo, crew and cabin boy of the Queen Charlotte, and Reuben Turner, "an old sea dog", are prominent on the roll. That wives of captains were eligible to membership is shown by signatures of a number of women. Among the signatures are some names that are still prominent in lake marine: Geo. Warner, Geo. McKay Jr., Thos. Quayle, John Quayle Jr., M. W. Warrington, Thos. Pennington, J. Hallenbeck, and Harriet M. Avery. Six of the Gabb family and four Duttons pledged themselves to lake water. One of the modern lake freight carriers, owned by the Northwest Transportation Company is named after S. R. Kirby, for a long time connected with the Detroit Dry Dock Company, that name still remaining with the company in the person of his son. This lends interest to the following inscription on the roll: Allen Kirby, master schooner Morgiana; Stephen R. Kirby, seaman, schooner Morgiana. A seaman on the schooner Huron set a good example in swearing off, for the names of master and crew follow that of the seaman's. The two books of record of the society, in possession of Chaplain Jones of the Bethel, contain many names that would waken memories of other days among lake men who have grown up with the business. The fine arts were not neglected then, for some master contributed a fair piece of verse telling the objects of the society, which during the winter of 1845 boasted of a comfortable reading room in the Commercial block, "open Wednesday and Friday evenings." Following is the first part of the captain's rhyme:

"Our temperance ship is ahoy, is ahoy,
All hands at their post, from captain to boy,
How grand and majestic she rides on the wave,
The true ark of safety—the drunkard to save."

Wonderful Power.

It is understood that President Hill of the Great Northern Railway demands for his proposed passenger line between Buffalo and the head of Lake Superior, boats that will make 20 to 21 miles an hour and carry 1,000 tons of freight in addition to very large passenger accommodations. Such requirements seem almost impracticable on the St. Mary's Falls canal draft of little more than 14 feet. A horse power of 6,000, or more than double that of the modern big steel freight boats on the lakes, would very probably be required in such a boat. Admitting that a 14-foot wheel could be used with 19 feet pitch, which would be very coarse, it would be necessary, allowing 12 per cent. for slippage, to turn 103 revolutions per minute in order to get a speed of 20 miles an hour.

An Engine Builder's Record.

Between October, 1891, and the coming October, S.F. Hodge & Co., Detroit engine builders, will have turned out seven triple and ten compound engines. This is believed to be the largest output of any exclusively engine building concern on the lakes. Below will be found particulars of the engines and the names of the boats where placed:

One 20, 32 and 54 by 42, Thomas Wilson, American Steel Barge Company.

One 20, 32 and 54 by 42, City of Venice, James Davidson, West Bay City.

Two 23, 37 and 62 by 42, Washburn and Pillsbury, American Steel Barge Company.

One 23 and 46 by 36, City of Charlevoix.

One 10 and 20 by 12, yacht, S. Langell, St. Clair, Mich.

Two 9¼, 14½ and 24 by 14, Visitor and Boneta, Detroit Boat Works.

One 10 and 20 by 12, Deer, T. W. Kirby, Grand Haven, Mich.

Three 20 and 40 by 36, car ferry, Craig Ship Building Company, Toledo, O.

Three 20 and 40 by 36, car ferry, Craig Ship Building Company, Toledo, O.

One 26, 42 and 70 by 42, world's fair passenger boat, American Steel Barge Company.

One 12 and 24 by 16, fish tug, T. W. Kirby, Grand Haven, Mich.

Auxiliary Machinery of the Mitchell.

With the exception of the ballast pump, all the auxiliary machinery on the Samuel Mitchell, illustrated with this issue, was built by the Globe Iron Works Company. The steering gear manufactured by this company is without doubt the best manufactured in the United States. The capstans, windlasses, boiler feed pumps, hoisting engine, etc., all came from the Globe works. The pressure regulator, which is set at 60 pounds, is the Burton patent and gives the best of satisfaction. The engines are packed with United States metallic packing. The Fisher electric plant, described in the REVIEW some time ago, is a feature of the boat. A search light on the stern is used in coming down the river at Cleveland, stern first, from the rolling mill dock. The only attention given the Noye dynamo is that of oiling it. The injector for boiler feed is of the Kennedy pattern, manufactured by the Forest City Brass Works.

From Various Sources.

Shipments of anthracite coal from Buffalo last week were only 89,552 tons, a decrease of about 10,000 tons.

Another Canadian schooner, the Lady Macdonald, which was sunk at Fair Haven in the gale of two weeks ago, has been given up as a total loss. She was owned by Capt. Ewart of Port Hope. No insurance.

Charles Groves, assistant superintendent in the ship yard of the Globe Iron Works Company, died at his home in Cleveland, Wednesday. Mr. Groves had been with the Globe company since the building of the Onoko, the first iron boat launched in Cleveland.

Little attention will be given to the sensational story sent around the lakes a few days ago about the owners and master of the schooner H. P. Baldwin trying to sink her when she was abandoned on Lake Michigan last fall. The Booth Packing Company is trying to collect a heavy salvage claim for picking the boat up, and this accounts for the testimony at the court hearing in Marquette.

To Locate Obstructions and Correct Charts.

In a report just sent on to the war department, Gen. Poe of Detroit discusses in a most complete manner the necessity of corrections in lake charts and takes up the question of new obstructions of different kinds, to which the attention of vessel owners and masters was especially directed during the period of low water last fall and in the spring just past. The report, which will undoubtedly receive strong endorsement from lake interests generally, is based on the results of surveys made since the opening of navigation in the vicinity of Colchester, Lake Erie, and on the St. Mary's river. These surveys, made with meager appropriations, are, of course, of only minor importance in comparison with the general work of this kind required, if the charts are to be used for navigating the lakes, as Gen. Poe has shown in the conclusions reached after detailing this preliminary work. The report says:

"During the fiscal year several projects have been submitted with a view to rendering the charts of the great lakes of the greatest possible use to navigators. Under date of Sept. 17, 1891, was proposed:

"1. A revision of all existing charts in regard to light-houses, fog signals, buoys, ranges, sailing lines, etc.

"2. Monthly publication during the season of navigation of bulletins giving all aids to navigation not on charts, reports of dangers derived from vessels' logs, location of wrecks, water levels, state of harbors, etc.

"3. At close of each season of navigation all engineer officers in charge of river and harbor works to send to the officer charged with the proposed duty, charts with the condition of their works platted thereon; also, any other information which may have come to their knowledge, including lights, buoys, range lines, sailing lines, etc., the information thus obtained to be compiled upon the published charts during the winter.

"4. Examinations to be made of newly discovered obstructions of limited areas.

"Under date of October 10, 1891, the following scheme for new charts to complete the set for the American coasts of the lakes was proposed, each chart named to be published on single sheet.

"General charts—Lake Superior, canal to Duluth; Lake Michigan, straits to Chicago, the scale in each to be 1,600,000.

"Coast charts—Lake Superior, Outer island light-house to Duluth; Marquette to Portage canal; Portage canal to Outer island light-house; Pointe Au Sable to Marquette; White Fish point to Pointe Au Sable; north shore from Duluth eastward, the scale to be 1:120,000. Lake Huron, Pointe Aux Barques light-house to Thunder Bay island light-house; Thunder Bay island light-house to Detour light-house, the scale to be 1:120,000.

"In the above the several charts are arranged in the order of their importance. St. Mary's river was not included in the scheme because more or less field work would have to be completed before new charts of this locality could be published.

"These projects or something of a similar nature will have to be carried out if the charts are to be rendered of the greatest service to navigators. The work already done, particularly in the location of the dangerous shoals in Lake Erie, has fully demonstrated the necessity which exists for work of this character. The Lake marine is of too great importance to the country at large for any effort looking towards its safety to be spared. When the United States government sells charts to navigators, these charts should embody the latest and most accurate information concerning the localities to which they refer, and everything should be done to make navigation safe and certain.

"From 1885 up to the opening of navigation in 1892 the lowest water surface of the lakes for the season has been less each year than the year before. This condition, however, is only temporary, and evidences now point to an increase in depths. Combined with this lowering in recent years, however, has been the great growth of the lake vessels, both in size and numbers, a growth that must be seen to be appreciated. Since the original surveys were made the maximum draft of vessels has increased from 9½ and 12 feet to 16 feet, and when improvements now in progress are completed it will be still further increased to 20 feet. As a consequence the larger and more expensive vessels are constantly discovering dangers previously unknown, and discovering them by the costly process of striking them. All dangers as discovered should at once be surveyed and located upon the charts in order to prevent the repetition of similar

accidents at the same point. Localities deemed perfectly safe for navigation when smaller vessels were used are now regarded with suspicion by the larger vessels and it is essential that certain special areas should be re-examined. Navigation of the lakes is attended with peculiar dangers, similar in kind but far different in degree, to those met with on the ocean. On the lakes vessels are never far from land, and what is worse, have land all around them. Running before a gale is never to be thought of. At certain season of the year gales are frequent and severe, and at all times an accurate knowledge of the locations of all dangerous obstructions is essential to safety. Accurate knowledge of this kind can be obtained in but one way, and that is from the charts. It is essential, therefore, that all the charts be kept constantly up to date. The commerce passing through St. Mary's river now amounts to 9,000,000 tons of freight, and that through the Detroit river to over 20,000,000 tons of freight annually; and this commerce is increasing with great rapidity. Interests of such magnitude require that no stone shall be left unturned for their protection.

"The survey of St. Mary's river has been begun, and everything is in readiness to push the work so that new charts of this locality may be published at the earliest possible date. The records of the former survey and of the river improvement will prevent all duplication of work, and will permit the survey to be done as quickly as possible. The organized districts in connection with river and harbor work now established at the chief cities of the lakes will greatly facilitate keeping all the charts up to date and will insure the maximum results with the minimum cost.

"In view of the great importance of this work to the lake marine, an estimate of \$50,000 for 'surveys and other expenses connected with correcting and extending the charts of the northern and northwestern lakes,' during the fiscal year ending June 30, 1894, in addition to an estimate of \$3,000 for 'printing and issuing charts for the use of navigators and electrotyping copper plates for chart-printing,' is submitted, in full confidence that the conditions now existing amply warrant this expenditure.

Only a technical description of the preliminary work on the St. Mary's river, where a survey was begun but a few weeks ago, is referred to in Gen. Poe's report, but full details of the Lake Erie survey is given as follows:

"Instructions from the chief of engineers require that if information of any obstructions to navigation not exhibited on the charts should be received, the same shall be communicated to the office of the chief of engineers, with an estimate of the cost of a survey. Among other obstructions so reported during the fiscal year were two shoals in the western end of Lake Erie, lying close to the course of vessels from Cleveland and eastern ports to the mouth of the Detroit river. One of these obstructions was reported about three miles north and west of Pelee Spit light-house, on the Canadian side of Lake Erie; the other was reported as making out from Little's point, near Colchester, Lake Erie, and was said to be due south of the wharf at Colchester and three-eighths of a mile outside of a shoal which was shown on the chart. An estimate of \$1,000 was submitted for the survey of the former shoal, and of \$610 for the latter. On account of the large commerce passing these obstructions they were considered to warrant a special examination, and accordingly orders for the survey of these shoals were issued; for the shoal off Little's point on Sept. 25, 1891, and for the shoal off Pelee Spit light-house on Nov. 19, 1891.

"During the fall of 1891 there was too much unfavorable weather to warrant an attempt to survey the shore off Little's point, and the order directing a survey off Pelee Spit light-house was issued too late in the season to permit anything to be done until spring; nothing but preparatory work was done, therefore, until May 20, 1892, when a lake survey party under the immediate charge of First Lieut. Charles S. Riche, corps of engineers, United States army, left Detroit for Colchester, Ont. Here most of the above work was finished; and on May 25 the party proceeded to Point Pelee, Ont., where all of the topographical and hydrographical work was completed and the party returned to Colchester on June 14. A new shoal was discovered to the north and west of Pelee Spit lighthouse upon which but 13½ feet of water was found. One of the shoalest spots was over a wreck, said to be the Nicholls, sunk in 1879, after the former survey of this locality had been completed. The importance of having all such dangerous shoals platted upon the charts at the earliest possible moment after they are discovered is shown by the fact that a vessel is reported to have grounded upon the

newly discovered shoal near Pelee Spit light-house shortly after the survey party left Point Pelee, and to have been delayed for some time and subjected to considerable expense before getting off. All the delay and expense thus incurred would probably have been saved had the shoal been marked upon the chart at the time.

"The lake survey party under Lieut. Riche, after their return to Colchester, remained there until June 30, and just managed to complete their work at the close of the fiscal year, when by law all moneys unexpended revert to the treasury, and if no new appropriation is available work must stop. At Colchester work on the shoal making out from Little's point was much interrupted by unfavorable weather. No new shoal was discovered, and it was demonstrated that no shoal existed in the place reported. The shoal shown in the chart, however, was found to be much more extensive, and to consist of sand, mud and clay, in which a large number of boulders are imbedded. A minimum depth of 12½ feet was found where 16½ feet is shown on the chart. Had it not been for the use of the 'sweeping bar,' however, very little change from the condition of the bottom at the time of the former survey would have been discovered, as the sounding poles and lead lines invariably showed from 4 to 6 feet more water than was shown by the bar."

Full Text of the Canal Toll Bill.

Following is the full text of the retaliatory measure adopted by both houses of congress as a result of the controversy over Canadian canal tolls:

Be it enacted, etc., That, with a view of securing reciprocal advantages for the citizens, ports, and vessels of the United States, on and after the first day of August, 1892, whenever and so often as the president shall be satisfied that the passage through any canal or lock connected with the navigation of the St. Lawrence river, the great lakes, or the waterways connecting the same, of any vessel of the United States, or of cargoes or passengers in transit to any port of the United States, is prohibited or is made difficult or burdensome by the imposition of tolls or otherwise which, in view of the free passage through the St. Mary's Falls canal, now permitted to vessels of all nations, he shall deem to be reciprocally unjust and unreasonable, he shall have the power, and it shall be his duty, to suspend, by proclamation to that effect, for such time and to such extent (including absolute prohibition) as he shall deem just, the right of free passage through the St. Mary's Falls canal, so far as it relates to vessels owned by the subjects of the government so discriminating against the citizens, ports or vessels of the United States, or to any cargoes, portions of cargoes, or passengers in transit to the ports of the government making such discrimination, whether carried in vessels of the United States or other nations.

In such case and during such suspension tolls shall be levied, collected, and paid as follows, to wit: Upon freight of whatever kind or description, not to exceed \$2 per ton; upon passengers, not to exceed \$5 each, as shall be from time to time determined by the president; provided, that no tolls shall be charged or collected upon freight or passengers carried to and landed at Ogdensburg, or any port west of Ogdensburg, and south of a line drawn from the northern boundary of the state of New York through the St. Lawrence river, the great lakes, and their connecting channels to the northern boundary of the state of Minnesota.

SEC. 2. All tolls so charged shall be collected under such regulations as shall be prescribed by the secretary of the treasury, who may require the master of each vessel to furnish a sworn statement of the amount and kind of cargo and the number of passengers carried and the destination of the same, and such proof of the actual delivery of such cargo or passengers at some port or place within the limits above named as he shall deem satisfactory; and until such proof is furnished such freight and passengers may be considered to have been landed at some port or place outside of those limits, and the amount of tolls which would have accrued if they had been so delivered shall constitute a lien, which may be enforced against the vessel in default wherever and whenever found in the waters of the United States.

The Pittsburgh, Chenango & Lake Erie Dock Company, which is to operate at Conneaut coal and iron ore docks for the new railway company known by the same name, is about to let a contract for equipping 1,500 feet of the new dock with cargo handling machinery.

In General.

Out of a total of over \$8,000,000,000 of capital invested in manufacturing in the United States, patents form the basis for the investment of about \$6,000,000,000.

Electrically lighted buoys in Gedney's channel are now generally pronounced a success. Large steamers enter the harbor at night and pick their way along the channel by the lighted buoys.

The mean depths of the various oceans of the world is estimated at about 12,700 feet. The average depth of the Pacific Ocean is about 1,100 feet more than that of the Atlantic. The North Atlantic and the Arctic seas become shallow the nearer the pole is approached.

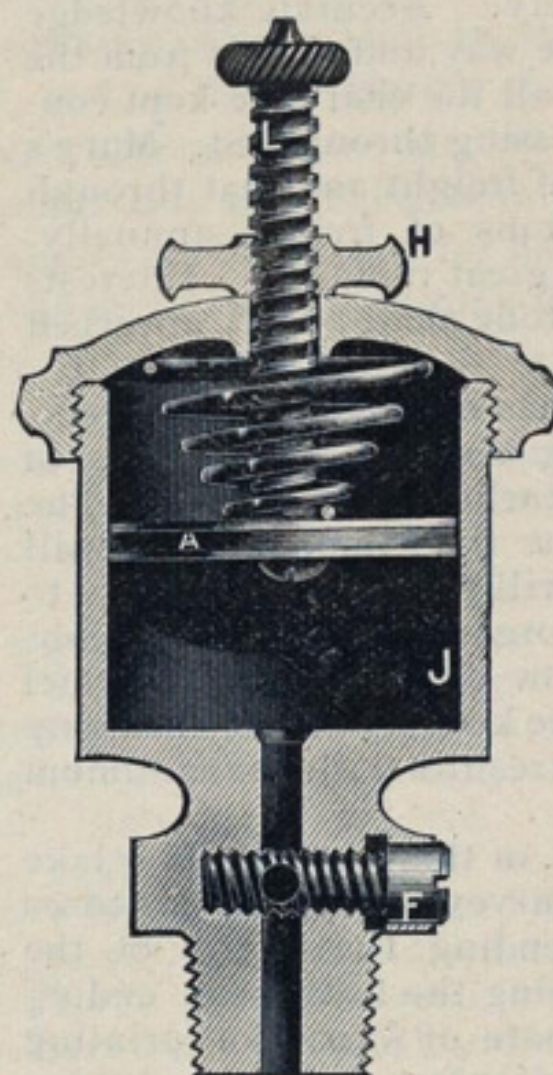
Teak, which has passed into proverb as the best material for ship-building, is superior to all other woods, from the fact that it contains an essential oil which prevents spikes and nails driven into it from rusting. This property is not possessed by any other wood in the world, and furnishes an explanation of the fact that ships built of teak are practically indestructible. Some have been known to last 150 years, and when broken up their beams were as sound as when first put together. The finishing of the steam yacht Wadena of Cleveland is of teak.

The journal on the main shaft of a coast wise steamer becoming heated, water was applied for the purpose of cooling it. The ship made the remainder of her trip successfully, but on examination it was found that contraction from the chilling effect of the water had cracked the journal longitudinally and transversely, and that one of the former cracks extended through the shaft, which was 14 inches in diameter and 22 inches long, to within two inches of one outside edge, and with that condition of the shaft the steamer had run over 100 miles.—The Engineer, New York.

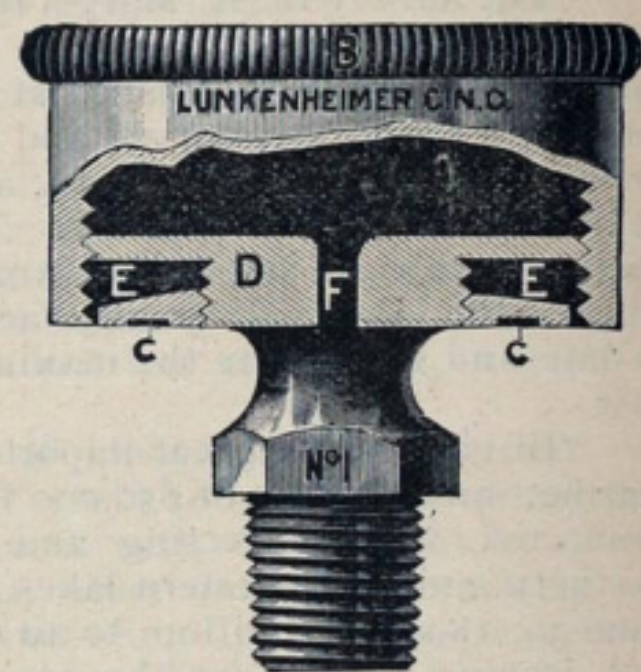
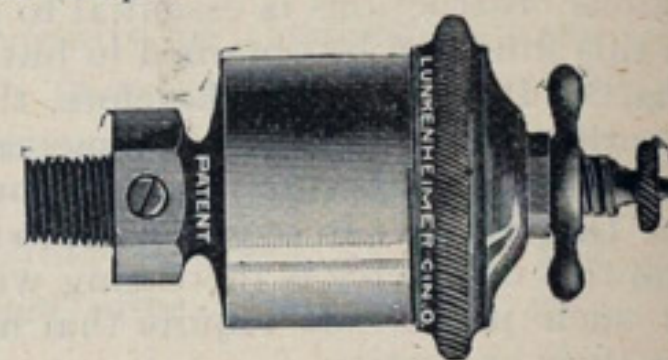
Water tube boilers are rapidly encroaching upon the field so long held by the fire-tube boiler, and every year sees some new type put on the market. It surprises even those who are supposed to know what is going on to see the aggregate horse power of water tube boilers installed within five years last past. One water tube boiler, which was practically unknown

five years ago, has, within this period, sold nearly 500 boilers, from 10 horse power up to 1,200 horse power each. Other companies have not sold so many, but they have sold a great many, and if the demand continues, as it undoubtedly will, the water tube boiler will be practically the only one in use. Water tube boilers are not confined to any special duty, but are to be found in all kinds of work on land and sea, and the rapidity with which they are coming into service is worth this brief mention.—The Engineer, New York.

Grease Cups.



Automatic Grease Cup.



Plain Grease Cup.

This automatic cup is provided with a leather packed plunger, which can be reversed by a thumb-nut, full or empty, as a vacuum can not form under it. The plain grease cup is adapted for jarring machinery. For prices write the Lunkenheimer Brass Mfg. Co., Cincinnati, O.

F. W. WHEELER,
President.

E. T. CARRINGTON,
Vice-President.

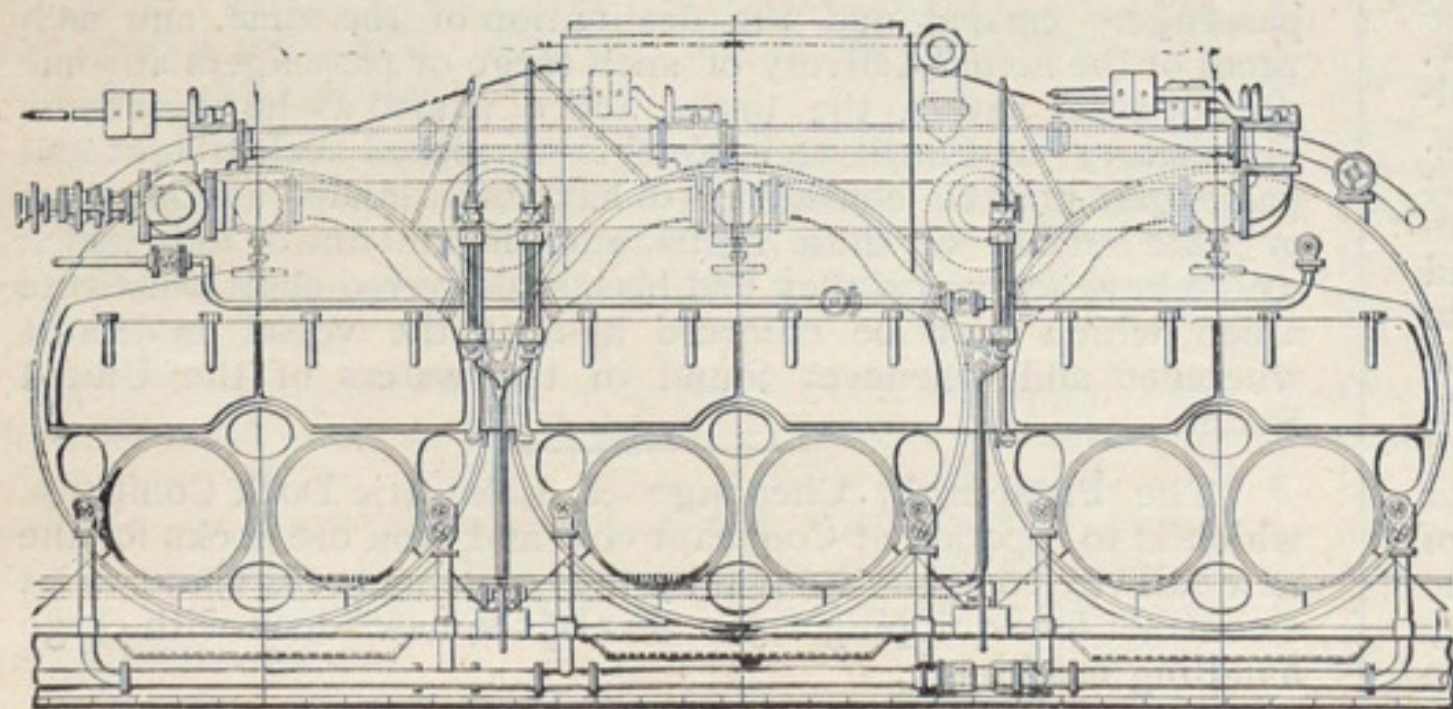
F. L. GILBERT,
Secretary.

F. W. WHEELER & CO.,

WEST BAY CITY, MICH.

© Builders of all kinds of METAL AND WOODEN SHIPS. ©

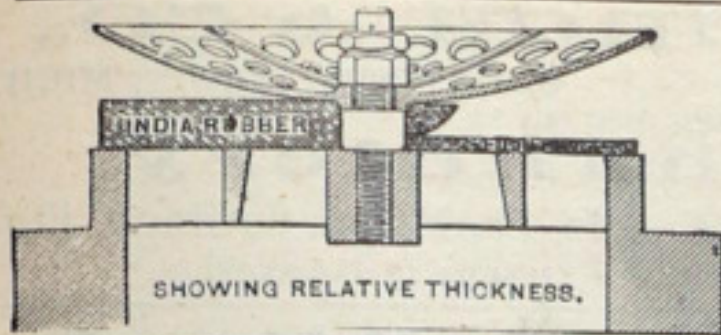
LAKE ERIE BOILER WORKS, BUFFALO, N. Y.



THE BEST EQUIPPED PLANT
IN AMERICA

FOR THE MANUFACTURE OF

MODERN MARINE BOILERS.



VULCANIZED FIBRE VALVES,
For Air, Circulating, Feed and Bilge Pumps.
FAR SUPERIOR to India Rubber or any
other material, at one-half the cost.
VULCANIZED FIBRE CO.,
New York Office, 14 Dey St. WILMINGTON, DEL.

H. B. & G. B. BURGER,
MANITOWOC, WIS.

SHIP BUILDERS AND CONTRACTORS.

Dock will admit vessels of 1200 tons, and will be enlarged soon to admit largest vessels on the lakes. Boxes will lift 350 ton vessels. Yard is fitted with a large spar derrick, and a stock of spars always on hand.

Northern Steamship Co.

GREAT NORTHERN RAILWAY LINE.

Finest Equipped Fleet on the Lakes. A-1 in Every Particular.

Northern Light, Northern King, North Wind.
Northern Wave, Northern Queen, North Star.
Capacity. 2,500 Tons Each.

No stops between Cleveland and Duluth and West Superior.
Bear in mind, in making shipments to St. Paul, Minneapolis and the Northwest, that this Company affords facilities superior to any other line.

Warehouse and Dock, 43-61 RIVER ST.

C. H. TUCKER, Gen'l Agt.

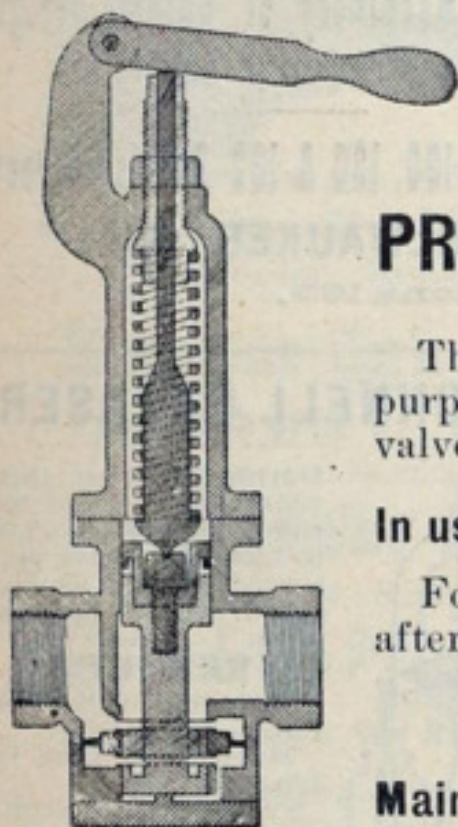
CHICAGO PHOTO-GRAVURE CO.

358 DEARBORN ST., CHICAGO, ILL.

COMMERCIAL WORK, BOOK ILLUSTRATIONS and ART REPRODUCTIONS.

Photo-Gravures for Advertising Purposes.

Represented by LOUIS SCHERZINGER, Room 27, Kendall Block, 106 Euclid Ave.
CLEVELAND, OHIO.



"It does its work"

BURTON'S PRESSURE REDUCING VALVE.

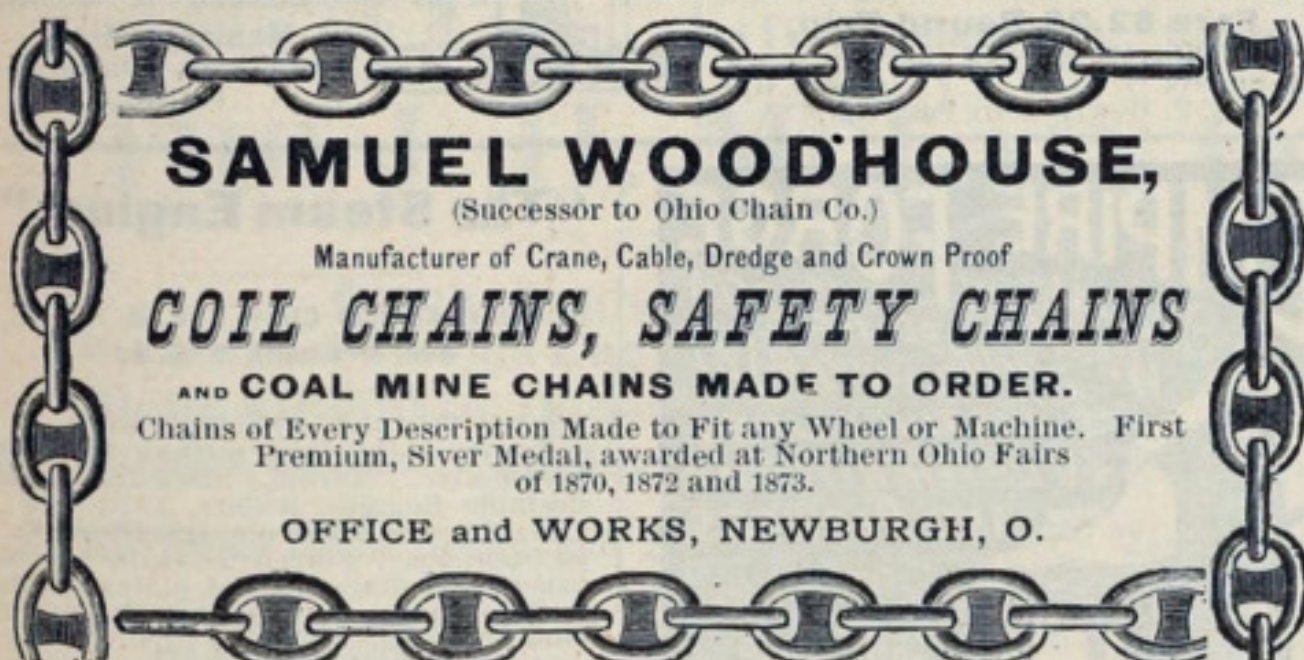
This cut shows the valve designed for marine purposes. The lever is for the purpose of forcing valve open if it should become dirty.

In use on twenty of the finest steel steamers.

For price list and letters telling how it works after two years' use, write

C. H. BURTON,

Main and Center Streets, CLEVELAND, O.



SAMUEL WOODHOUSE,

(Successor to Ohio Chain Co.)

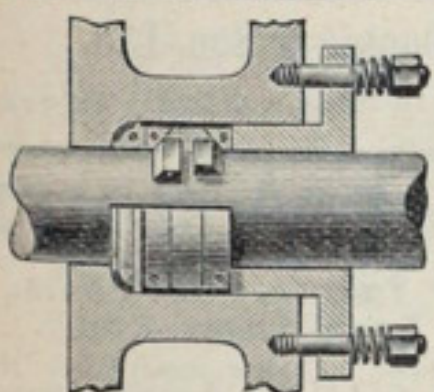
Manufacturer of Crane, Cable, Dredge and Crown Proof

COIL CHAINS, SAFETY CHAINS

AND COAL MINE CHAINS MADE TO ORDER.

Chains of Every Description Made to Fit any Wheel or Machine. First Premium, Silver Medal, awarded at Northern Ohio Fairs of 1870, 1872 and 1873.

OFFICE and WORKS, NEWBURGH, O.



Forrest's Silver Bronze Packing.

Applied to any stuffing box, without disconnecting. Steam, air and water tight without the aid soft packing, under the highest steam pressure and piston velocity, automatic, admits of excessive vibration, lashing and crowding of the rod, does not bind, economical, guaranteed to outlast all other packings. Used by the largest iron works, steamships and electric light companies for years all over the world. References. Agents wanted everywhere.

Address, 115 Liberty Street, New York City.

DRY DOCK DIRECTORY.

CLARK DRY DOCK COMPANY, DETROIT, MICH.

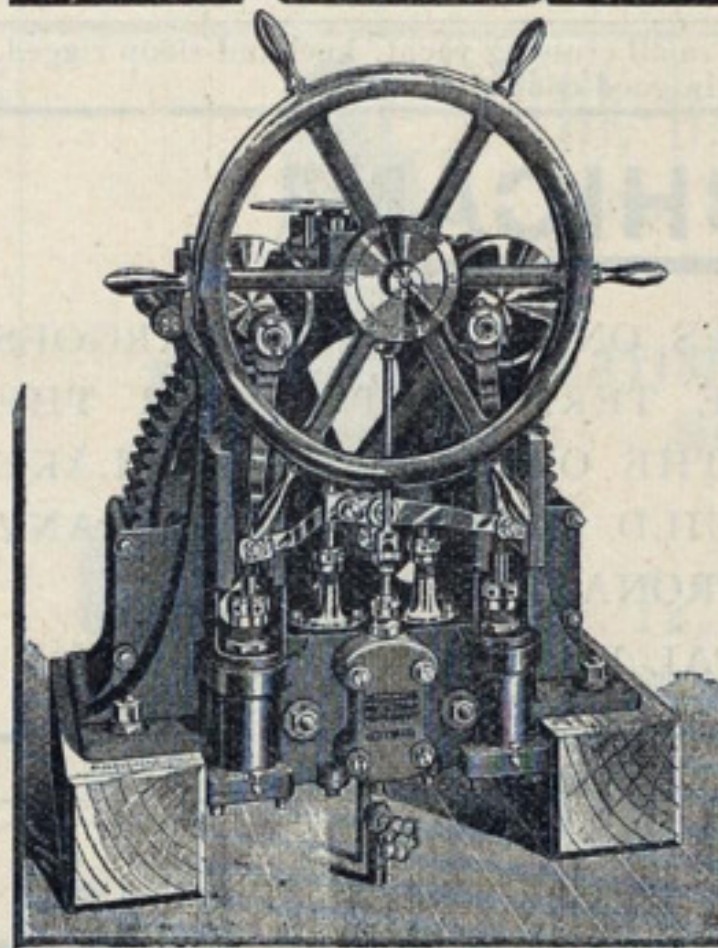
TWO DOCKS: { 360 feet long; gate 68 feet wide; depth on sill and keel blocks, 10 1/2 feet.
220 " " " 42 " " " " " " " " 11 1/2 "

W. D. RANDALL & SON,

— MANUFACTURERS OF —



VESSEL AND STEAM BOAT FURNISHING A SPECIALTY.
Tel. 664. 1307 to 1315 Quimby Ave., CLEVELAND, O.



No. 4 BECK Steam Steering Gear.

TUG PATTERN—Floor Space 18x36 In.

Changed from steam to hand gear instantly. Rudder moved hand-over, through one or more turns of wheel as desired. Is self-locking. Will cushion any blow on rudder and return to position automatically. All gears are machine cut. Position of Rudder shown by Indicator at all times.

PAWLING & HARNISCHFEGER,

BUILDERS OF

Beck Duplex Feed Engines,
Steam Steering Gears and Hoisting Engines,
Electric, Steam and Hand Cranes,
Special Machinery and Tools.

156-168 Clinton St. Milwaukee, Wis.

Insurance Co. of North America.

INCORPORATED 1794.

LAKE MARINE DEPARTMENT,

GEO. L. McCURDY, Manager, Chicago, Ill.

CHARLES PLATT, President.

WILLIAM A. PLATT, Vice-President.

EUGENE L. ELLISON, 2d Vice-Pres't. GREVILLE E. FRYER, Sec'y & Treas.

JOHN H. ATWOOD, Assistant Secretary.

Capital, paid up in cash..... \$3,000 000.00

Assets..... 9,278,220.00

Atlas Engineering Co., Limited,

of BOSTON, MASS.,

Civil and Mechanical Engineers and Architects,

AND DESIGNERS OF

Docks, Warehouses and Mills, Freight and Passenger Stations, Industrial Buildings of every description and Special Structures. Superintendents Construction. Estimates Furnished.

Electric Light and Power Plants. Electric Broad and Narrow Gauge Railroads. High Grade of Efficiency. Permanent Electrical Wiring. CORRESPONDENCE SOLICITED.

Work Undertaken in ANY Part of America.

Office, 258 Washington St., BOSTON.

P.O. Address, 3492 (P.O.Box), Boston, Mass.

MARINE REVIEW LINER EXCHANGE.

Space under this heading may be used gratis by our advertisers or subscribers to call attention to vessels or any craft, machinery, new or second hand, that they may have for sale. Those wanting machinery of any kind or wishing to purchase vessels, are invited to take advantage of the same offer. Employers in need of professional men or men who want positions may avail themselves of the opportunities offered. Each item will be limited to three lines. Letters concerning same must mention number attached to item and be addressed MARINE REVIEW, 516 Perry-Payne Building, Cleveland, O.

138—FOR SALE—Excursion steamer, capacity 200 passengers. For particulars address this office.

139—WANTED—Compound or triple expansion yacht engine, small size.

140—FOR SALE—One 5½ by 8 by 10-inch condensor pump, and one 8 by 4 by 10-inch boiler feed pump.

141—FOR SALE—Double deck engine, 6 by 8 inch cylinders.

142—WANTED—A vessel or tow barge of 350,000 or 400,000 carrying capacity, to charter up to Dec. 1st. Apply to Geo. D. Sheriffs, 126 Ferry St., Milwaukee.

143—FOR SALE—45 foot tug with engine 13 by 15 inches.

144—FOR SALE—Pair double H. P. Engines 12½ x 14 in., suitable for a tug. Good as new.

145—FOR SALE—One new 14 x 16 inch Upright Engine, suitable for marine or stationary work.

146—FOR SALE—One new 10 x 12 inch Upright Engine, suitable for marine or stationary work.

147—FOR SALE—At a bargain, small cruising yacht, keel and sloop rigged. Suitable cabin and boat generally in good condition.

"THE MICHIGAN"

ISSUES POLICIES ON HULLS AND CARGOES ON FAVORABLE TERMS. IT IS FOR THE INTEREST OF THE OWNERS OF THE LAKE MARINE TO BUILD UP A HOME COMPANY BY THEIR PATRONAGE.

AGENCIES AT PRINCIPAL PORTS.

Walker's Marine BLACK.

Walker's Smoke Stack BLACK.

Cheaper and Better than any Black Paint now made.

In use by N. Y. Central & H. R. R. R., N. Y. Ontario & Western, West Shore, Rome, Waterloo & Ogdensburg, Cromwell Line Steamers, Lake Michigan & Lake Superior Transportation Co., and many others.

Manufactured and for Sale by

THE WALKER CHEMICAL CO.,
JERSEY CITY, N. J.

L. H. OWEN, PRESIDENT, F. H. VAN CLEVE, SEC. CAPT. GEO. BARTLEY, SUPT.
Chicago. Escanaba. Escanaba.

ESCANABA TOWING & WRECKING CO., Escanaba, Mich.

Tugs, Lighters, Steam Pumps, Hawseers, Hydraulic Jacks and Diving Appliances always ready.

TUG MONARCH, Engine Compound, Cylinder 16 and 30 inches diameter, 30 inch.

Stroke, Steam Pressure Allowed, 125 pounds.

TUG DELTA, Cylinder 20 by 22, Steam Pressure Allowed, 105 pounds.

TUG OWEN, Cylinder 20 by 24, Steam Pressure Allowed, 104 pounds.

CENTRIFUGAL PUMPS, Seven and Fourteen Inch Suction.

H. G. TROUT,
KING IRON WORKS,
BUFFALO, N. Y.,

MANUFACTURERS OF

TRIPLE EXPANSION,
THREE CYLINDER,
FORE AND AFT

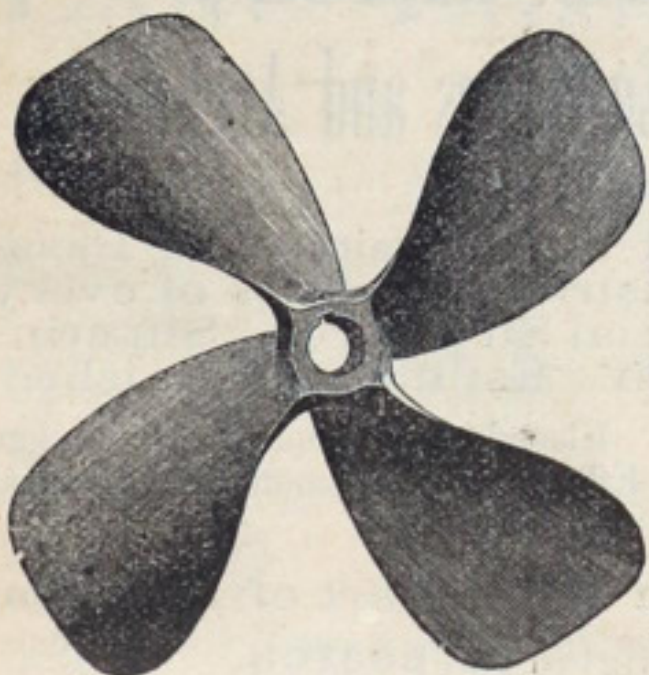
And STEEPLE COMPOUND
MARINE ENGINES,

High and Low Pressure Engines,
Sectional, Propeller,
Tug and Yacht Wheels.

Cowles Aluminum and Manganese
Bronze Propeller Wheels.

These Wheels are noted for their extra speed, towing power and proportionate saving of coal.

PRICES QUOTED ON APPLICATION.



P. M. CHURCH & CO.,
SAVINGS BANK BLOCK, SAULT STE. MARIE, MICH.
LEADING DEALERS IN
Ship Chandlery,
Marine Hardware, Paints, Oils, Packings, Cordage, Etc.
FIRST-CLASS COPPERSMITH AND TINSHOP IN CONNECTION.

The Jenks Ship Building Co.
GENERAL SHIP BUILDERS,
Correspondence Solicited. **PORT HURON, MICH.**

WANTED.

A Vessel or Tow Barge,
of 350,000 or 400,000 carrying capacity to charter up Dec. 1st.

Apply **GEO. D. SHERIFFS, 126 Ferry St., MILWAUKEE.**

SHERIFFS MANUFACTURING COMPANY,

C. STARKE, Pres. W. H. MEYER, V. Pres.
THOS. W. SHERIFFS, Manager.

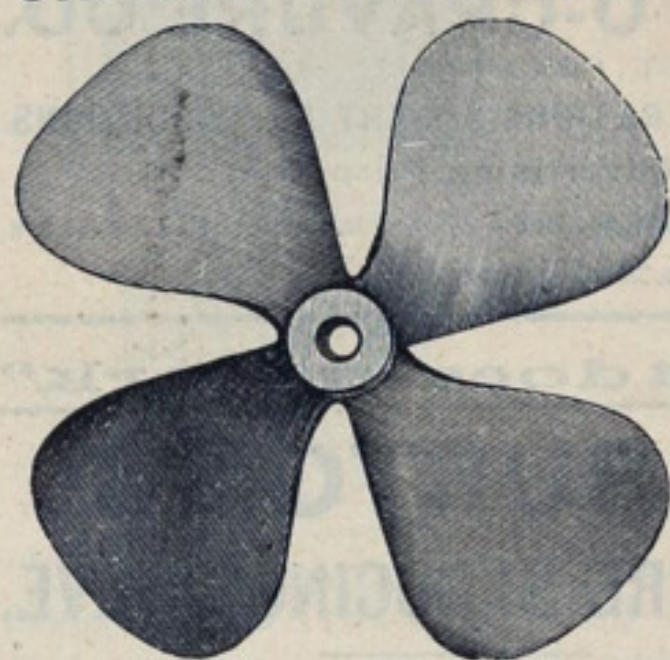
Manufacturers of

MARINE ENGINES,
PROPELLER WHEELS,

Dredge Machinery of Latest Design.
MARINE REPAIRS AT ALL HOURS.

124, 126, 128, 130 & 132 Barclay Street,
MILWAUKEE, WIS.

Telephone 163.



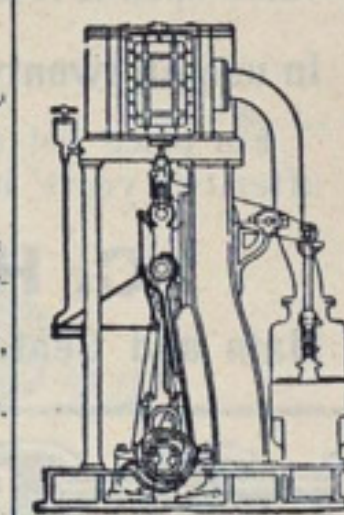
The D&C
STEAMER CITY OF DETROIT
daily at 8:30 A.M. to

PUT-IN-BAY and RETURN \$1.00.
Meals, Refreshments. Brass and String Music
Evening Lake Rides every Monday and Saturday,
8 P.M., from Superior Street Wharf.

SATURDAY NIGHT EXCURSIONS TO DETROIT.
From June 5 to October 1,
Giving a Full Day in that Beautiful City.

Fare \$2.25 Round Trip.
Wharf 23 River St., 10 P.M.
A. A. SHANTZ, G. P. A. T. F. NEWMAN, G. A.
E. P. HOWELL, City Pass. Agt.

THE O'CONNELL GREASER,

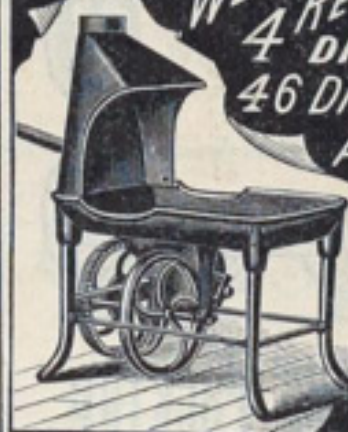


During the past three years hundreds of marine engines of from 2,000 to 4,000 h. p. have been served, as well as high speed electric light engines.

RESULTS:

Sure control of Crank Pin.
Stoppage of Lard Oil account.
Perfectly clean Engine
O'Connell & Cahill,
Manistee, Mich.
Dark lines indicate apparatus.

EMPIRE FORGE
SPECIAL-
WESTERN.
4 RELIABLE WESTERN.
& UNIVERSAL.
4 DISTINCT LINES.
46 DIFFERENT FORGES
AND BLOWERS.
SEND FOR CATALOGUE
EMPIRE
PORTABLE
FORGE
CO.
LANSINGBURGH, N.Y.



"The Steam Engine."

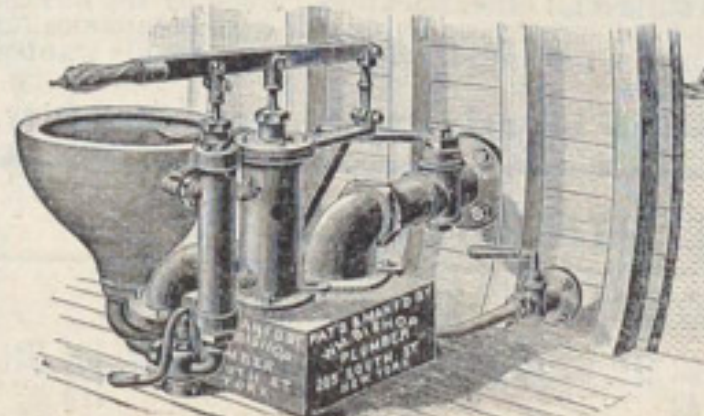
By Daniel Kinnear Clark, C. E. M. I. M. E.,
Hon. Member A. S. M. E.

A practical and exhaustive work, descriptive of the most modern types of Locomotive, Marine, Stationary and Portable Engines, Boilers, Valve Gear, Link Motions, Triple and Quadruple Expansion, Fuel, Forced Draught. 1,500 pages; 1,300 diagrams and plates drawn to scale, 4 vols., cloth, \$16.00 each, or four monthly payments of \$4.00 each, carriage prepaid. Send for descriptive circulars.

Blackie & Son, Ltd.

73 Bible House, New York.

COMBINATION PUMP WATER CLOSET



For Yachts, Pilot Boats,
Naval Ships, Etc.

For above or below water line. No tank needed, and when below water line you can flush bowl without having to use pump.

WILLIAM BISHOP,
Plumber, Coppersmith & Steam Fitter,
Telephone 4811 Cortlandt,
205 South Street, NEW YORK.
Yacht Fittings a Specialty.

U.S. RICHARDSON, Pres't

C. J. CONNELL, Sec'y

U.S. Richardson Fueling Co.



COAL

DOCKS (FOOT OF NORTH MARKET ST. 18TH STREET BRIDGE. NORTH PIER. ILLINOIS CENTRAL SLIP "C")

Office, Foot of North Market St.

CHICAGO.

Industry File Works

A. & H. COUGH, Props.
Manufacturers of
FILES AND RASPS
Equal to the best English File.
* OLD FILES REBUT. *



OFFICE AND WORKS:
48 Columbus St., Cleveland, O.
C. GOUGH, Manager. Mention the REVIEW.

Keystone Cork Works.

ALFRED L. BUTZ,
Importer and Manufacturer of
Machine Cut CORKS,
U. S. STANDARD

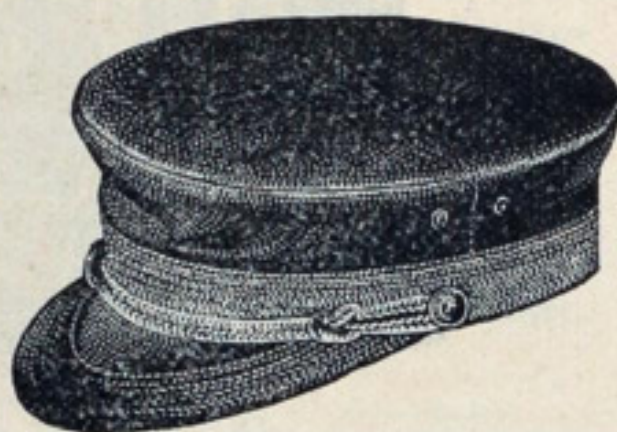
Cork Life Preservers

Granulated Cork for Refrigerators.

212 Market Street,
FACTORY: 829, 831 and 833 North Third St.
PHILADELPHIA, PA.
Cable Address: BUTZ.

FRANK G. OVERBEKE

TAILOR AND OUTFITTER.



SEND SIZE and

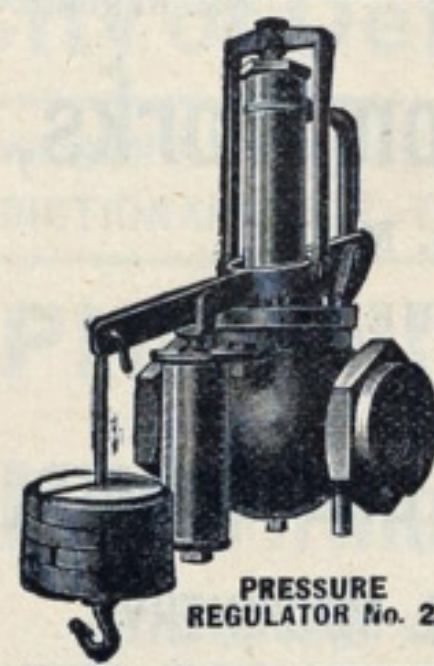
\$2.50

— FOR YOUR —

OUTING CAP.

Boat Crews uniformed at short notice, according to club regulations and satisfaction guaranteed. Catalogue sent on application. Western agents for Howard Place, New York City.

112 Woodland Ave., Cleveland, O.



PRESSURE
REGULATOR No. 2.

THE DAVIS Pressure Regulator

For Boat Work is the Most Successful.

SATISFACTION GUARANTEED.
Simple, Accurate, Durable.

MANUFACTURED BY

G. M. DAVIS & Co.
96 North Clinton St., CHICAGO, ILL.

For Rent—Offices,

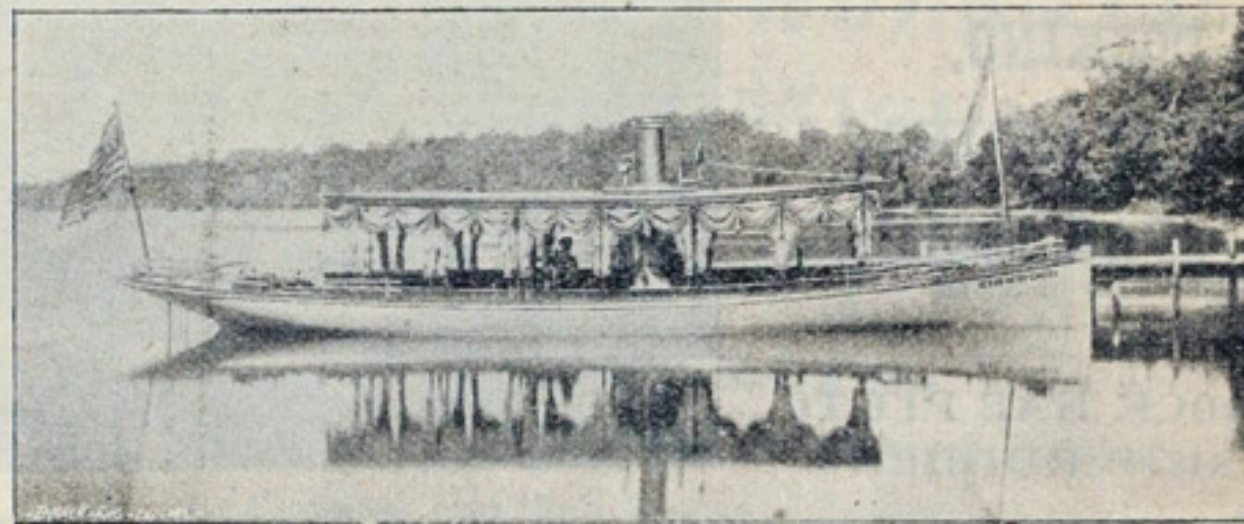
In the Fire-Proof **PERRY-PAYNE BUILDING,**

Single and in Suites, some with Vaults.

Headquarters for **BANKING, IRON AND VESSEL INTERESTS.**

For terms apply to **H. P. McINTOSH,** 201 Perry-Payne Bldg., Cleveland, O.

LAUNCHES AND STEAM YACHTS,



P. L. SWORD & SON,

6 S. WATER ST.

CLEVELAND, O.

THE ROBERTS SAFETY WATER TUBE MARINE BOILER,

For Yachts, Launches and other Steamers.

THE ORIGINAL FIXED WATER LINE PIPE BOILER

"Imitation the Sincerest Flattery." We are collecting royalties from the customers of many infringers.

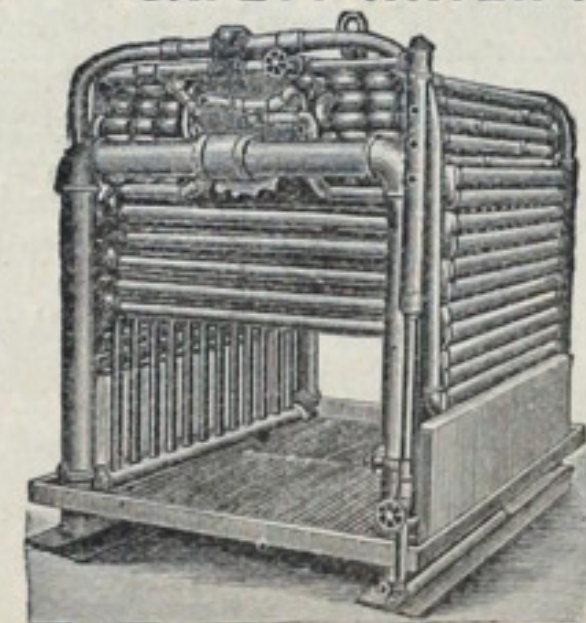
NEARLY 400 IN USE.

SAFE, RELIABLE, SIMPLE, LIGHT WEIGHT, ECONOMICAL, NO SHOP REPAIRS, SMALL SPACE. Send for illustrated Pamphlet and other reading matter, with hundreds of enthusiastic letters from purchasers and engineers.

The Roberts Safety Water Tube Boiler Co.

Works covering 12,000 sq. ft. of ground at
RED BANK, N. J.

18 Cortlandt Street, NEW YORK CITY.




V.O.T. LINE OF TUGS

OFFICE,
MAIN STREET BRIDGE.
W. A. COLLIER, MANAGER
CLEVELAND, O.
TELEPHONE 409.

TUGS
ALVA B.
JOE HARRIS
H. L. CHAMBERLAIN
W. D. CUSHING, TOM MAYTHAM
DREADNAUGHT, C. G. CURTISS
STEAMPUMPS, HAWSERS,
LIGHTERS, ETC.

FURNISHED ON
SHORT NOTICE



SUBMARINE WORK IN CHARGE OF WALTER V. METCALF

CON. STARKE.

JOS. WOLTER.

AUG. RIEBOLDT.

RIEBOLDT, WOLTER & CO.,

SHIPBUILDERS,



SHEBOYGAN, WIS.

FLOATING DRY DOCK WILL LIFT VESSELS OF 400 TONS.

HAYES, HEIM & STACK,

MANUFACTURERS OF

MATTRESSES, PILLOWS AND BEDDING.

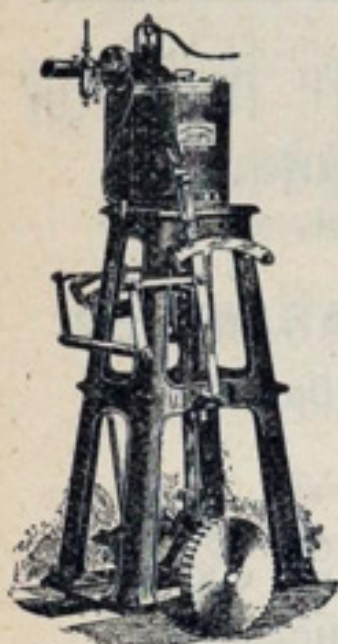
Telephone 539. We make a specialty of fitting out vessels.

70 EAST RIVER STREET, CLEVELAND, OHIO.

MONEYmade easy Manufacturing
Rubber Stamps. Send for
Price List of Outfits, to
J. F. W. Dorman & Co.,
217 East German Street,
Baltimore, Md., U. S. A.

J. D. WILSON.

M. HENDRIE.

**Montague Iron Works,**

MONTAGUE, MICH.

WILSON & HENDRIE, Proprietors.

MANUFACTURERS OF

Marine Engines and Boilers,

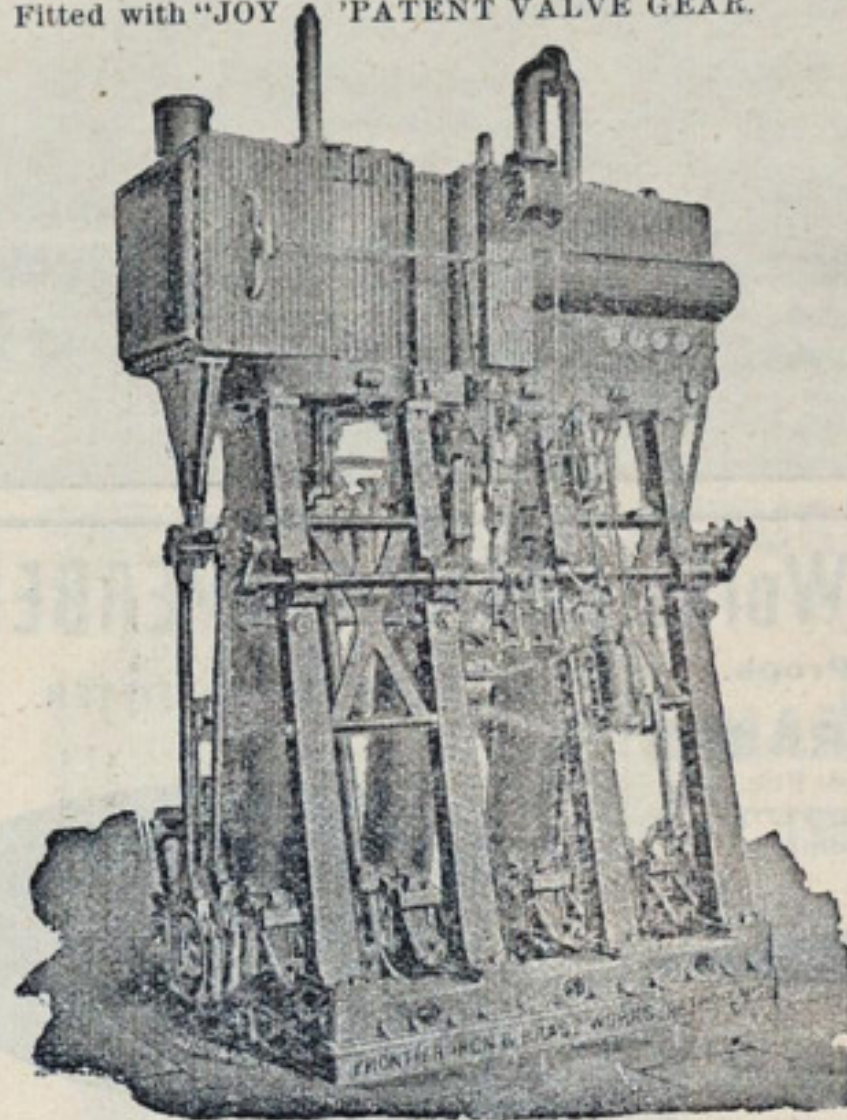
AND GENERAL MILL MACHINERY.

**JENKINS BROS.' VALVES**

Every valve tested and warranted, all parts interchangeable.
Nothing but best Steam Metal used in the manufacture.
Keyed Stuffing Box and Disc Removing Lock Nut
Is used only in the Jenkins Bros.' Valves.
None are genuine unless stamped with "Trade Mark."
Should you order, INSIST on having Jenkins Bros.' Valves.
71 JOHN STREET, NEW YORK. 31 & 33 N. CANAL ST., CHICAGO.
21 NORTH FIFTH ST., PHILA. 105 MILK STREET, BOSTON.

THE FRONTIER IRON WORKS,

Fitted with "JOY" PATENT VALVE GEAR.



DETROIT, MICH.,

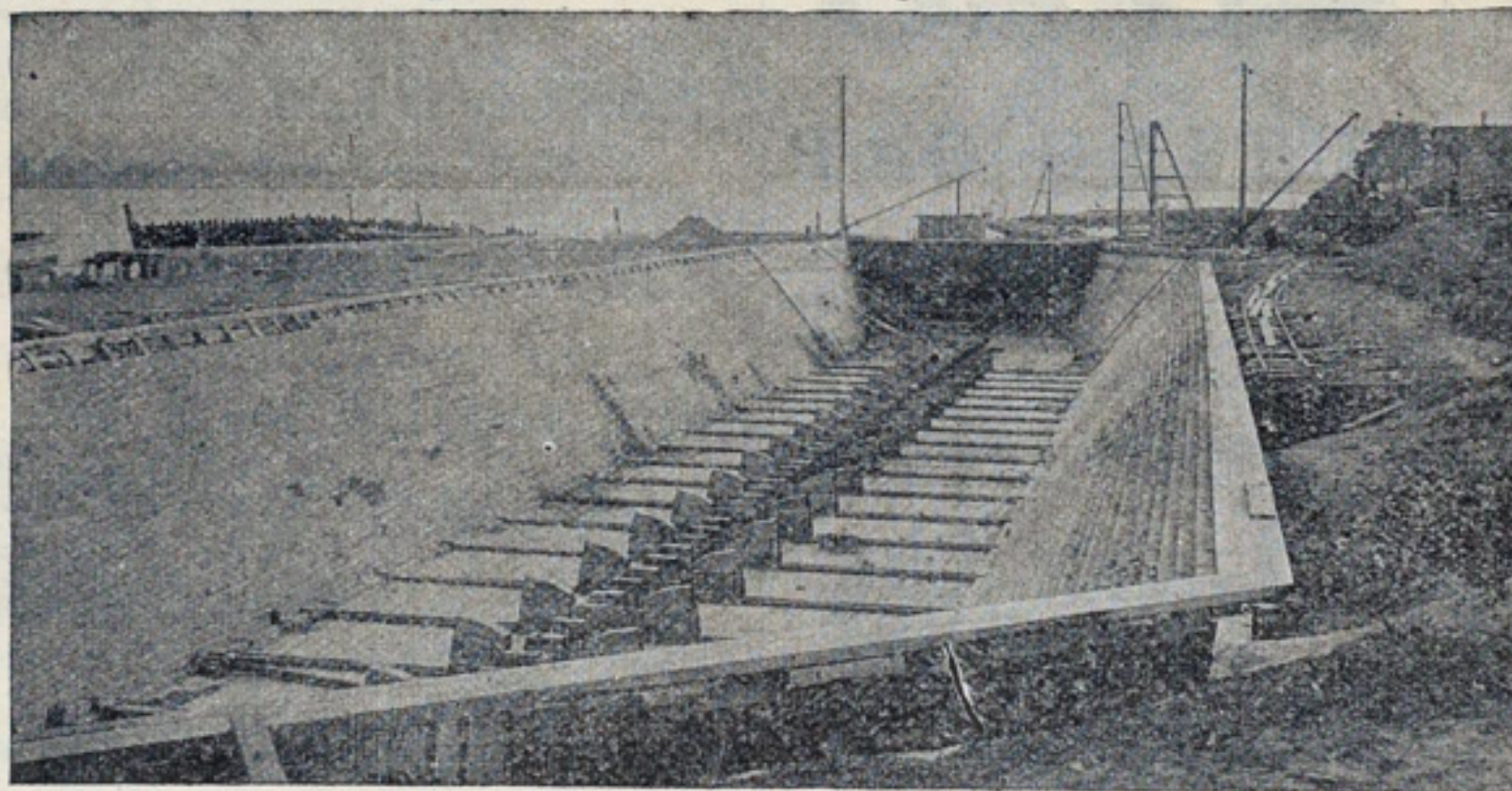
Builders of

TRIPLE EXPANSION

and all kinds of

Marine EnginesEngines furnished
for Steamships:

T. W. Palmer,
Livingstone,
Majestic, Tampa,
John Mitchell,
Nyanza, Fedora,
Geo. F. Williams,
Mackinaw,
Keweenaw,
Jno. Harper,
W. F. Sauber,
and Iosco.
Panther, (fore and compound)

DUNFORD & ALVERSON, PORT HURON, MICH.**SHIP
BUILDING.**DOCKING,
REPAIRING,
SPAR MAKING.DOCK HAS PIT TO
SHIP RUDDERS.**NEW DOCK.**

(Largest on the Lakes.)

Length: 400 feet.

Width: { on top 95 feet.
bottom 55 "
at gate 62 "

Depth: { to floor 20 feet.
to sill 18 "
on blocks 16 "

Nearest Modern Dock
to the SAULT or
MACKINAW.

McMYLER MANUFACTURING CO., 180 COLUMBUS STREET, CLEVELAND, O.

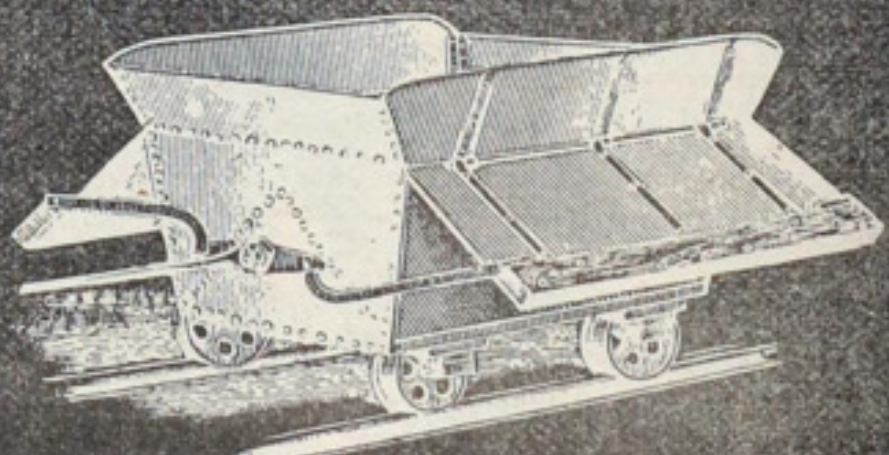
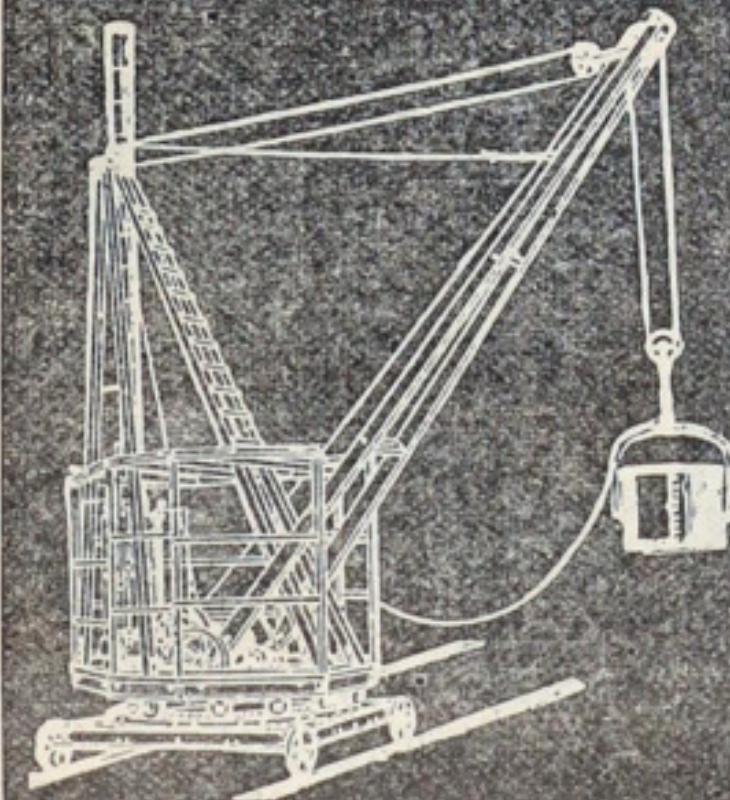
SOLE MAKERS OF THE

McMYLER PATENT REVOLVING STEAM DERRICKFOR HANDLING COAL, ORE AND COARSE FREIGHT
OF ANY DESCRIPTION.

This Derrick can Lift Load, Alter the
Radius of Boom, Swing in Either
Direction at Will of Operator, and
can Propel Itself on Track any De-
sired Distance.

BUILT FOR ANY CAPACITY WANTED

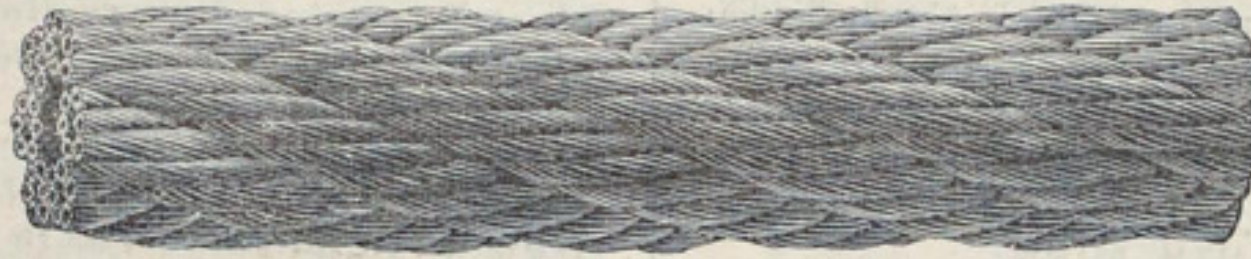
BUILDERS OF
CONVEYORS, COAL BUCKETS, ORE
BUCKETS AND DUMP CARS.



WASHBURN & MOEN MFG. CO.,

Makers of Iron, Steel and Copper,
Manufacturers of IRON, STEEL AND COPPER WIRE for all Purposes.
WIRE ROPE AND CABLE.

Galvanized Iron Wire Rope for
Ship's Rigging.
Tiller Rope. Switch Rope.
Copper, Iron and Tinned Sash
Cords.
Galvanized Crucible Cast Steel
Wire Rope for Yacht's Rigging.



Galvanized Steel Cables for
Suspension Bridges.
Standard Copper Cable and Copper
Wire Rope.
Transmission and Standing Rope.
Wire Clothes Lines and Picture
Cords. Hoisting Rope.

And all the Fixtures and Appliances required for use with the foregoing.

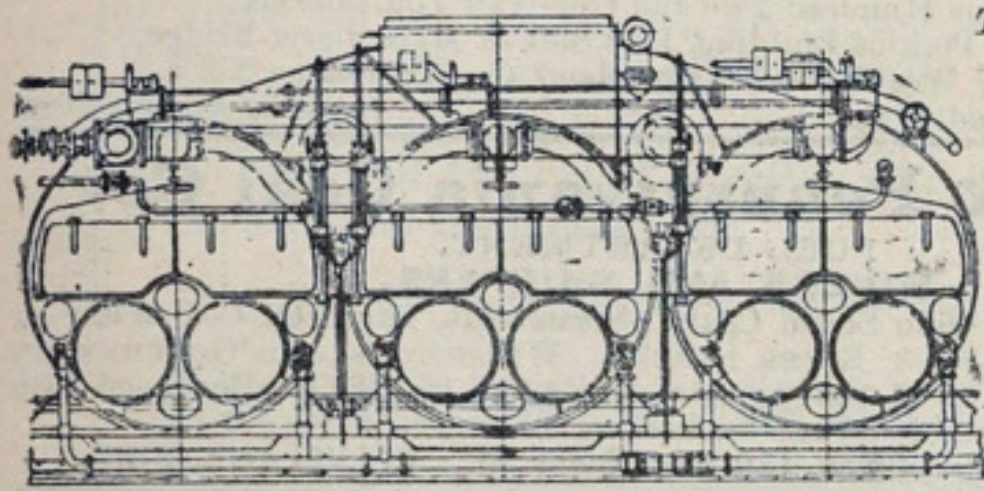
SEND FOR PRICE LISTS, CIRCULARS AND DESCRIPTIVE PAMPHLETS.

FACTORIES AND ROLLING MILLS: GROVE ST., WORCESTER, MASS.
QUINSIGAMOND, MASS. (near Worcester.)
WAUKEGAN, ILL. (near Chicago.)

OFFICES AND WAREHOUSES: NEW YORK, PHILADELPHIA,
PITTSBURGH, SAN FRANCISCO,
CHICAGO, WORCESTER, MASS.

Send 25 cents in stamps to Marine Review for
Photo-Gravures of Virginia, City of Detroit and Wadena.

LAKE ERIE BOILER WORKS.



The Best Equip-
ped plant in
America for
the manufact-
ure of modern
Marine Boil-
ers.

BUFFALO, N. Y.

TUG FOR SALE.

MARY E. PIERCE,

45 feet long, 13 feet beam, engine 13 x 15 inches, boiler 4½ by 9 feet
allowed 130 pounds.

Write HAND & JOHNSON, Foot of Main Street, BUFFALO, N. Y.

JOHNSTON BROTHERS,

Ferrysburg Steam Boiler Works,
FERRYSBURG, MICH.

Marine, Locomotive and Stationary Boilers,
Tanks and Sheet Iron Work.

REPAIRS PROMPTLY ATTENDED TO.

"THE KRIEBEL" STEAM ENGINES.



STATIONARY, MARINE & HOISTING
ENGINES WITH VERTICAL OR HORIZONTAL
STEEL BOILERS. SEND FOR CATALOGUE
RICE & WHITACRE MFG. CO. CHICAGO.

CHEAP BOOKS.

Key to Engineering.....\$0 25
Common Sense in Making
Steam.....0 25
Kedge Anchor, bound in cloth 2 50
Roper's Hand-Book of Marine
Engines.....3 00
If you want any of these books
enclose money and address to
MARINE REVIEW, 516 Perry-Payne
Bldg., CLEVELAND, O.

C. H. McCUTCHEON,

(Successor to SAMUEL McCUTCHEON.)

Copper, Tin and Sheet Iron Manufactory,
Steamboat and Engineers' Supplies.

All kinds of Brass Cocks, Globe Valves and Couplings, &c. Iron Pipe and Fittings, and
Mill Supplies. Rubber Belting, Hose and Packings, Springs, Valves, &c.,
Leather Belting and Usdurian Packing.

Telephone No. 68.

No. 18 Ohio Street BUFFALO, N. Y.

ERIE RUBBER CO.,

ERIE, PA.,

—MANUFACTURERS OF THE—

KEYSTONE MARINE VALVE.

These RED, AIR AND FOOT VALVES, are the
Best Rubber Valves made.

SEND YOUR ORDER FOR "PATTERSON'S NAUTICAL
DICTIONARY" (\$5) TO THE "MARINE REVIEW" AT ONCE.

PHOENIX IRON WORKS

—MANUFACTURERS OF—

Modern Marine Engines AND Boilers

1223 to 1231 Fourth St., PORT HURON, MICH.

Telephone Nos. { Office, 15. Special Attention Given to Repairs.
Residence, 192.

DULUTH DIRECTORY.

THE CLYDE IRON COMPANY,

OFFICE AND WORKS: 302, 304, 306 & 308 Lake Avenue, South, DULUTH, MINN.
R. A. WEBSTER, Supt.

Machinists, Foundrymen, Blacksmiths and Steam Fitters. Special attention given Marine
Work. Ship Chandlery & Mill Supplies, Packings, Waste, Oils, Greases, Boiler Purgers, etc.

MANISTEE IRON WORKS CO.

Manistee, Mich.,

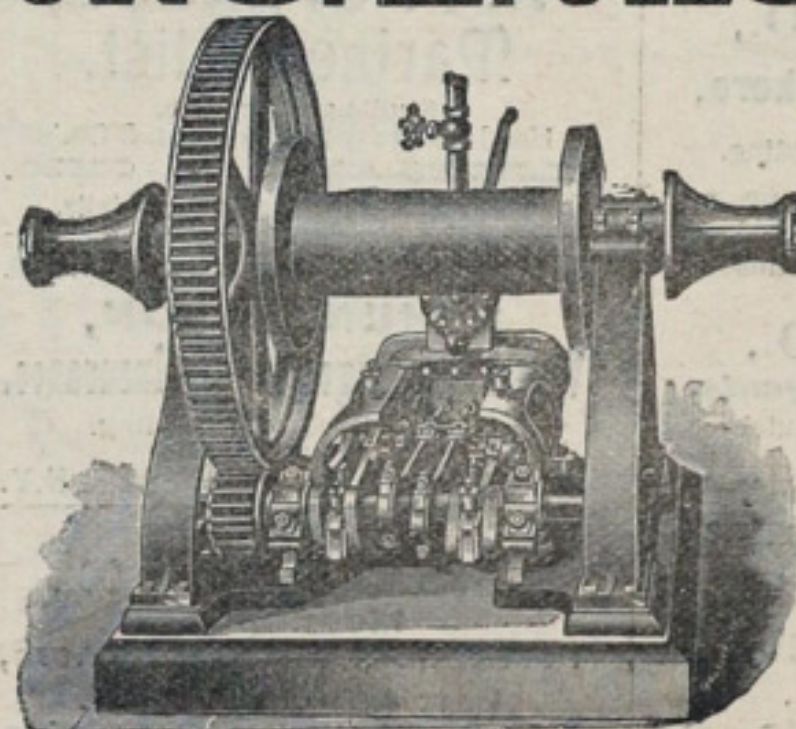
MANUFACTURERS OF

Marine and Stationary Engines and Boilers.

Triple Expansion, Fore and Aft, and Steeple Compound
Engines, and High Pressure Engines,

General Mill Machinery and Salt Well Outfits.

JNO. L. JACKSON



Builder of DUPLEX HOISTING
AND DECK ENGINES.

Completely under control of throt-
tle, reverse without link, stopped,
started or reversed instantly, will
hold load without brake.

These Engines can be arranged for
Driving Rolls and many other
purposes.

PLAIN, FINISHED and AUTOMATIC
ENGINES,
From Heavy Patterns at Moderate
Prices.

Vertical, Horizontal, Marine and
Locomotive

BOILERS,
Strictly First-Class & Highest Test.

Saginaw, Mich.

Send for Circulars and Prices.

SHERMAN, HOYT & DUSTIN,
LAWYERS AND PROCTORS IN ADMIRALTY.
Western Reserve Building, Room 701 to 706, CLEVELAND, O.

HARVEY D. GOULDER,
LAWYER AND PROCTOR IN ADMIRALTY,
CLEVELAND, O.

ROGER M. LEE. **LEE & TILDEN,** DUANE H. TILDEN.
Proctors in Admiralty.
Telephone 1191. 504 Perry-Payne Bldg., CLEVELAND, O.

H. R. SPENCER,
ATTORNEY AT LAW and PROCTOR IN ADMIRALTY.
218 Superior St., DULUTH, MINN.

C. E. KREMER, Attorney and Counselor-at-Law and
Proctor in Admiralty.
Rooms 14, 15 and 16, Bryan Block, 164 LA SALLE ST., CHICAGO, ILL.
CAPT. R. T. LEWIS. S. V. GILBERT.

LEWIS & GILBERT,
Telephone 140. VESSEL AGENTS & MARINE INSURANCE.
36 and 37 Exchange Building, DULUTH, MINN.

JOHN C. FITZPATRICK, JOHN MITCHELL, JOHN F. WEDOW, ALFRED MITCHELL.
MITCHELL & CO.,
Vessel and Insurance Agents,
508, 509 and 510 Perry-Payne Building, CLEVELAND, OHIO.
Office Telephone, 737. Residence, John Mitchell, 3506. J. C. Fitzpatrick, 2305.

GILCHRIST & GILCHRIST,
ATTORNEYS-AT-LAW
AND PROCTORS IN ADMIRALTY,
No. 55 Newberry & McMillan Bk.
DETROIT, MICH.

T. G. Crosby, C. A. Macdonald,
J. J. Rardon.

CROSBY, MACDONALD & CO.
General Insurance Agents,

RIALTO BUILDING, CHICAGO, ILL.
H. S. LORD, J. H. NORTON.

LORD & NORTON,
Attorneys-at-Law,
Proctors and Advocates in
Admiralty,
DULUTH, MINN.

White, Johnson & McCaslin,
ATTORNEYS-AT-LAW,
—AND—

Proctors in Admiralty,
26-27 Blackstone Building,
CLEVELAND, - OHIO.

JOSIAH COOK, ATTORNEY,
And Counselor at Law and Proctor and
Advocate in Admiralty.
Office, Nos. 12, & 14 Spaulding's Exchange,
BUFFALO, N. Y.

Special attention given to all U. S. court
and admiralty business in all its branches
and the collection of Seamen's wages.

THOS. WILSON,
MANAGING OWNER
WILSON'S TRANSIT LINE.
Gen. Forwarder.
Freight and Vessel Agent.
CLEVELAND, O.

WARNER & CO.,
Vessel Agents and Brokers,
Nos. 511 & 512 Perry-Payne Building,
Superior Street, CLEVELAND, O.

C. F. Palmer. Chas. Hutchinson.
P. J. Minch.

PALMER & CO.,
Vessel Owners and Agents,
(John H. Palmer and John T. Hutch-
inson, Associates.)
Perry-Payne Bldg., Cleveland, O.

W. A. HAWGOOD, C. C. CANFIELD.
HAWGOOD & CANFIELD,
Vessel Agents and Marine Insurance,
604-605 Perry-Payne Bldg.,
Cleveland, - Ohio.
Telephone No. 2395.

W. W. Widdowson
ATTORNEY-AT-LAW AND
PROCTOR IN ADMIRALTY
Marine Notary.
ASHLAND, WIS.

C. W. ELPHICKE, A. L. FITCH,
JAS. A. MYERS.
C. W. ELPHICKE & CO.,
Vessel Owners and Agents,
Marine Underwriters,
Rooms 10, 11 and 12, 6 and 8 Sherman St.
WHEELER BLOCK, CHICAGO.
Telephone 1194.

E. T. HITCHCOCK,
Average Adjuster,
184 Main St.,
BUFFALO, N. Y.

Moore, Bartow & Gilchrist,
Ship Brokers & Agents,
Nos. 611 & 612 Perry-Payne Building,
Superior Street, Cleveland, O.

H. J. WEBB & CO.
SHIP BROKERS, VESSEL OWNERS and AGENTS,
Established in 1856. H. J. Webb & Co.
will charter vessels for the lake trade.
Special attention given to chartering ves-
sels in the Lake Superior Iron Ore trade,
both for the season and single trip.
No. 606 & 607 Perry-Payne Building,
Cleveland, O. Office Telephone No. 338,
Residence No. 3228.

J. T. ROSE, FRANK B. LAZIER.
ROSE & LAZIER,
Vessel Agents and Brokers,
and Marine Insurance,
16 Board of Trade,
DULUTH, - MINN.

H. F. SPRAGUE,
Marine Artist,
Studio at Huron, O.
Headquarters at MITCHELL & Co.'s
CLEVELAND, - OHIO.
Oil Paintings of Vessels a Specialty.

Capt. LYMAN HUNT. JAMES P. HUNT.
L. HUNT & SON,
Vessel Brokerage & Marine Insurance,
Room 9, Exchange Building.
Telephone No. 522.
No. 202 Main St., BUFFALO, N. Y.

Established 1857.
THOMAS MARKS & CO.,
Merchants,
Forwarders and Shipowners,
Port Arthur, Canada.
N. B.—Special attention given to char-
tering vessels.

FUELING COMPANIES.

To Owners and Masters of Steam Barges.

We beg to call your attention to the fact that we have steam lighters at the ports of Cleveland, Ashtabula and Buffalo, specially equipped for fueling vessels, which enable us to run alongside steamers and fuel them while they are unloading during day or night time. We also have fueling docks at the above ports, at which we can take care of vessels not desiring to avail themselves of the services of the steam lighters. We shall in the future, as in the past, handle nothing but the best grade of Pittsburg coal, and respectfully solicit your patronage.

PICKANDS, MATHER & CO.

The Sandusky Coal Co.

J. T. SOLON, Agent, SANDUSKY, OHIO.

Miners and Shippers of Jackson Hill, Wellston & Cannel Coals,
Also, Hocking, Massillion and Pittsburgh always on hand.

Boats Coaled Night or Day. Fueling a Specialty. Derricks on Big 4 Docks.

THE CUDDY-MULLEN COAL CO.,
Dealers in COAL. Docks at Government Pier, Whiskey Island, and Ad-
joining Globe Dry Dock.

All fully equipped with Revolving Derricks; also, Lighter Carrying Derrick,
and One Hundred Two and One-Half Ton Buckets.

Main Office, 81 Perkins Building, East Side of Main Street Bridge.
Dock Office, 127 West River St., Cleveland, O. Telephone No. 8.
Boats Coaled Day and Night. Docks at Amherstburg.

Ohio & Pennsylvania Coal Co.

FUEL DEPARTMENT.
MINERS AND SHIPPERS,

Youghiogeny and Ohio Steam Coals. Steamboats, Tugs, etc., Coaled day or
night, Docks FOOT WEST RIVER STREET. WHISKEY ISLAND GOVERNMENT
PIER and C. & P. R. R. SLIPS. Also STEAM LIGHTER—Equipped with
Revolving Derrick and (100) two ton buckets.

Telephone 1608. Office, 130 West River St., CLEVELAND, OHIO.

GEO. A. SIMPSON, Compass Adjuster.
ALL NAUTICAL INSTRUMENTS CAREFULLY REPAIRED.

Office with UPSON, WALTON & Co., 161 River St., CLEVELAND, OHIO.



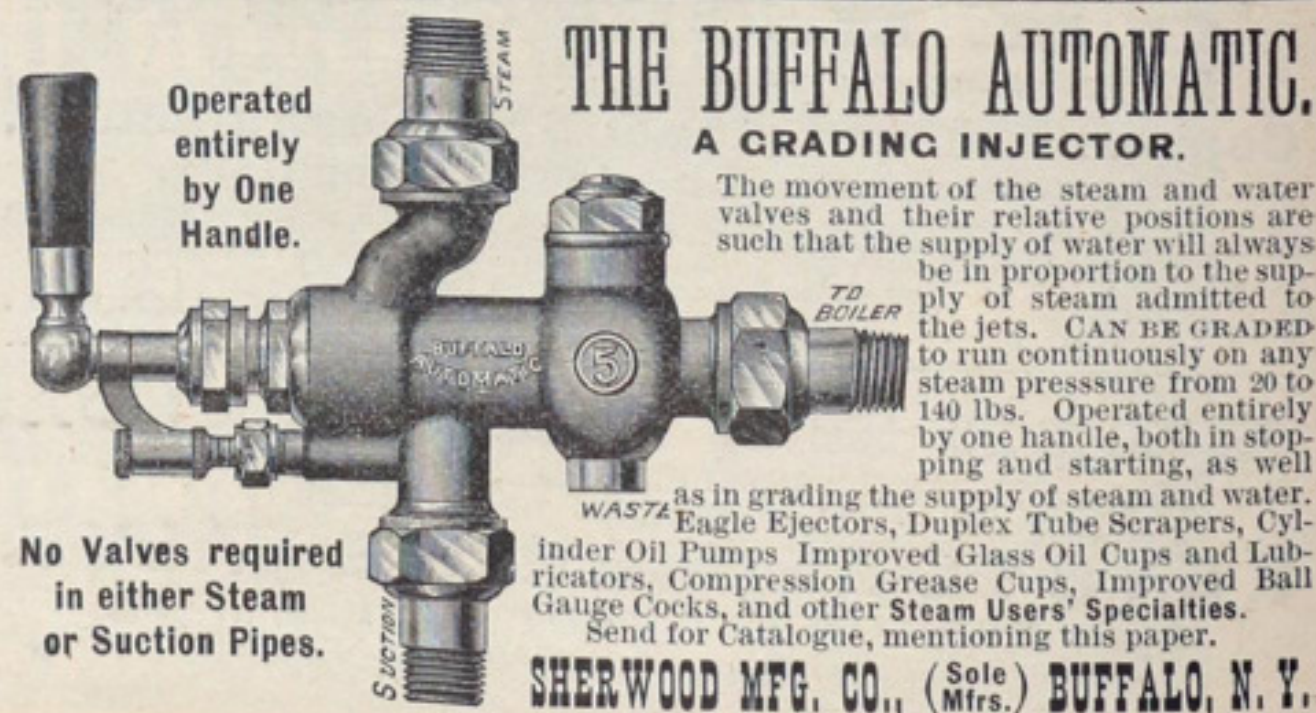
Have Double Ratchet, Solid Frame,
Adjustable Legs, Detachable Lever.
Run Lightest, Make Strongest Blast & Last Longest.
ALL DESIRABLE STYLES AND SIZES.

Sold by Hardware and Machinery Dealers everywhere.
Send for Catalogue of these and

Hand & Power Blower, Blacksmith Drill Presses, &c.
THE FOOS MFG. CO. SPRINGFIELD, OHIO.

PAUL OLSON,
Manitowoc, Wis.

Ship Chandlery and Sail Loft,
PAINTS AND OILS. FULL LINE OF OIL-SKINS ON HAND.
AGENT FOR JOS. P. MANTON'S STEAM STEERER.



Operated
entirely
by One
Handle.

The movement of the steam and water
valves and their relative positions are
such that the supply of water will always
be in proportion to the sup-
ply of steam admitted to
the jets. CAN BE GRADED
to run continuously on any
steam pressure from 20 to
140 lbs. Operated entirely
by one handle, both in stop-
ping and starting, as well
as in grading the supply of steam and water.

Eagle Ejectors, Duplex Tube Scrapers, Cylin-
der Oil Pumps, Improved Glass Oil Cups and Lub-
ricators, Compression Grease Cups, Improved Ball
Gauge Cocks, and other Steam Users' Specialties.
Send for Catalogue, mentioning this paper.

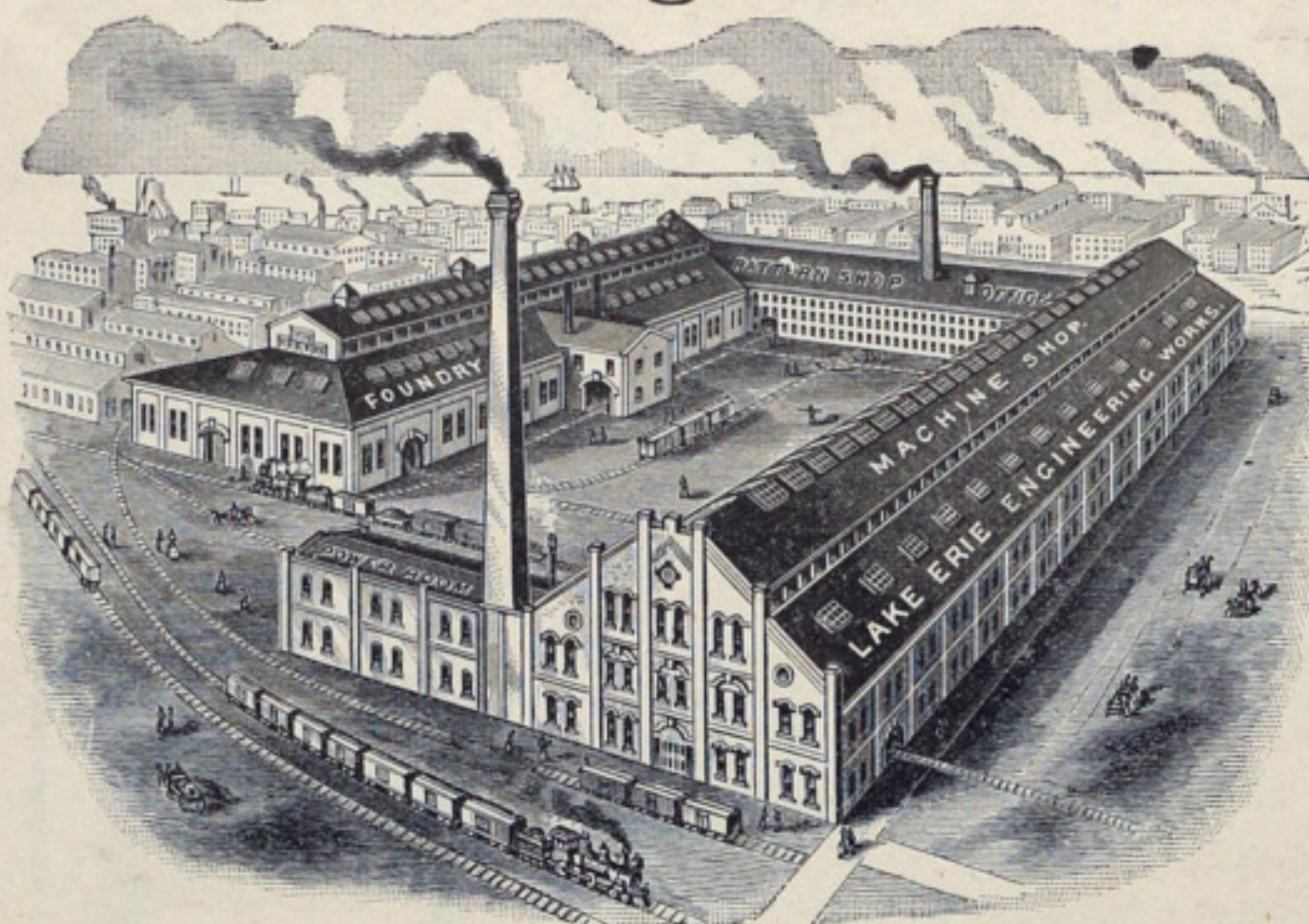
SHERWOOD MFG. CO., (Sole Mfrs.) BUFFALO, N. Y.

Lake Erie Engineering Works, Buffalo, N. Y.

RICHARD HAMMOND, Pres't.

JOHN COON, Sec'y and Treas.

Steam Engines,
Compound, Triple
and Quadruple
Expansion
Engines,
From 250 to 10,000
Horse Power
For Marine and
Stationary
Service.



Special Designs
for Cable
Railways and
Electric Power
Plants.

The Best Economy
and Regulation
Guaranteed.

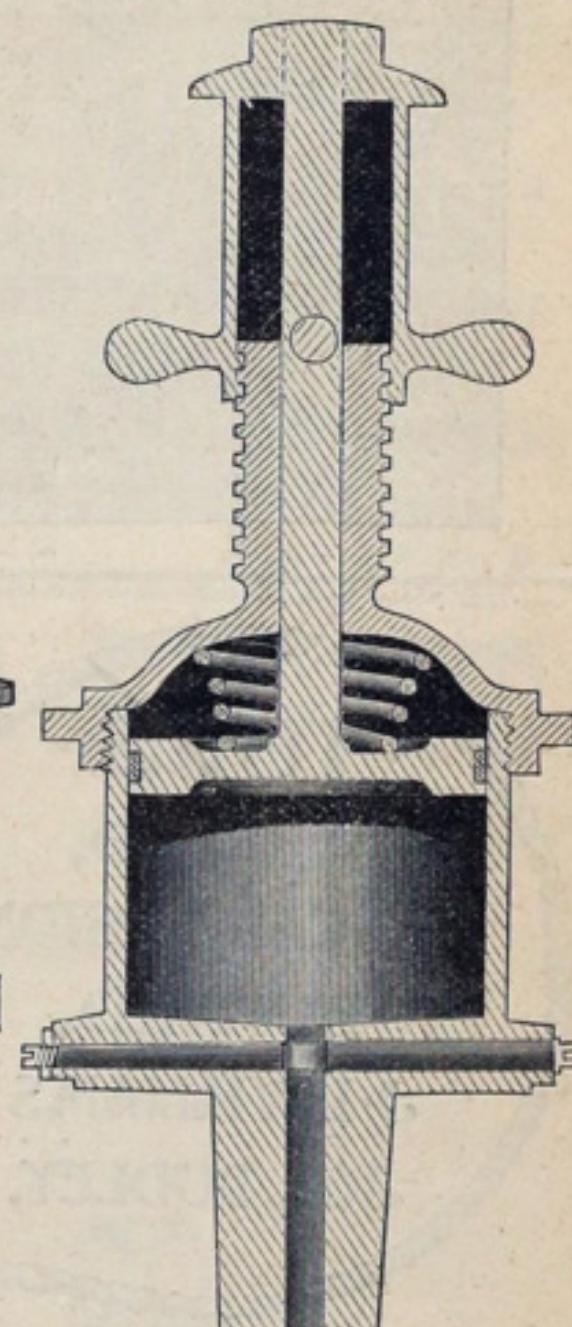
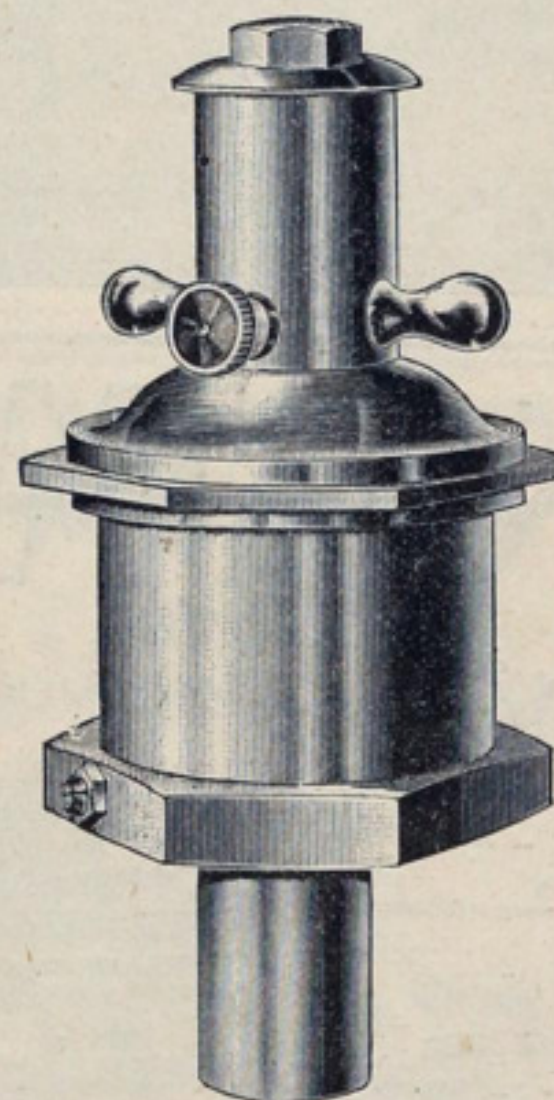
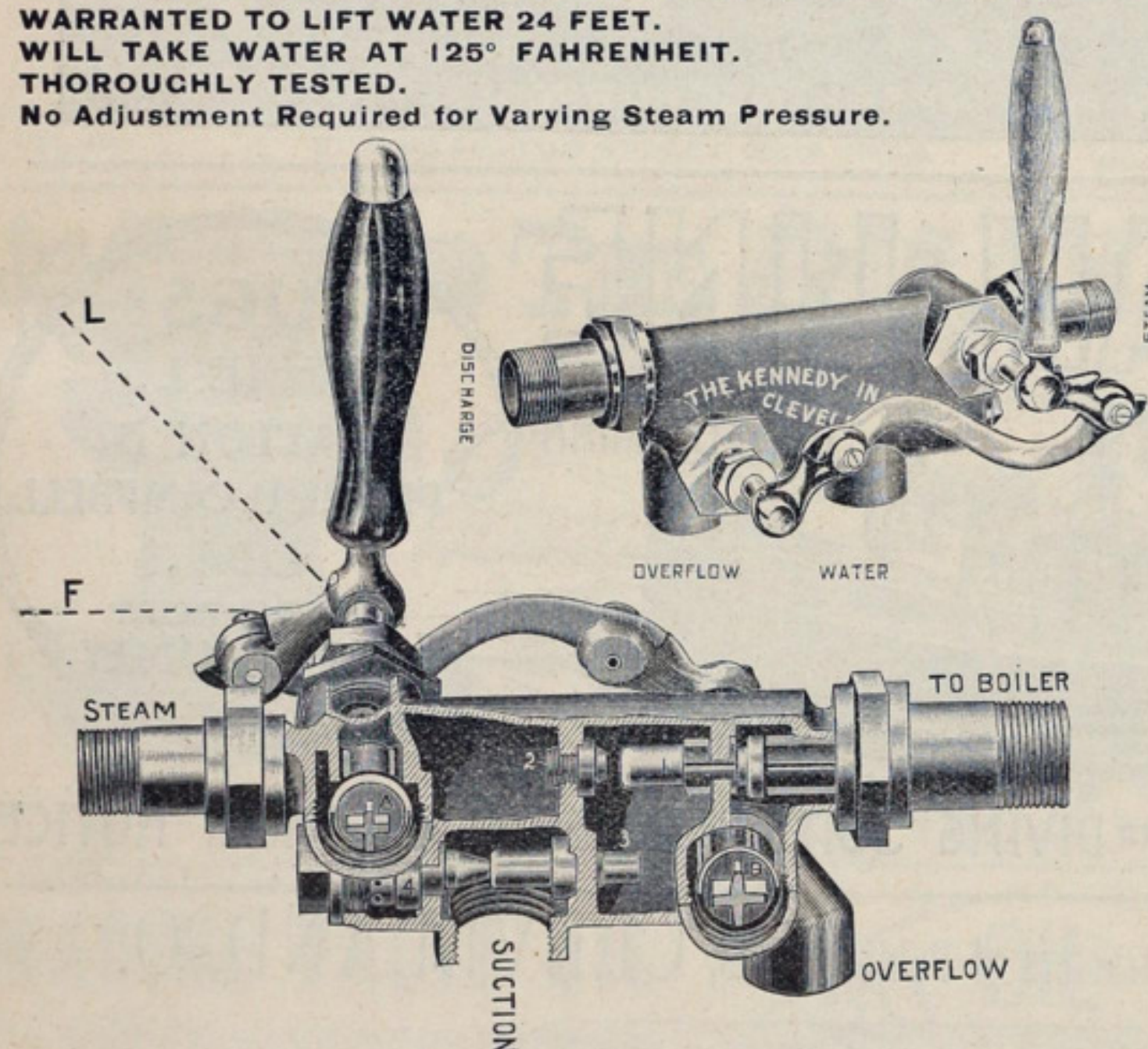
THE BEST EQUIPPED PLANT IN AMERICA.

FOREST CITY BRASS WORKS,

24 Leonard Street, CLEVELAND, O.

KENNEDY INJECTOR.

WARRANTED TO LIFT WATER 24 FEET.
WILL TAKE WATER AT 125° FAHRENHEIT.
THOROUGHLY TESTED.
No Adjustment Required for Varying Steam Pressure.



COLUMBA CUP.

For Crank Pins, Stationary En-
gines, Loose Pulleys,
Dynamamos, &c.

"The man who knows so much about his profession that he cannot learn something about it by reading and study, has a very small profession or a very large cranium."

Marine and Mechanical Literature and Periodicals.

	Per Year.
Nautical Dictionary, (Patterson).....	\$ 5 00
Nautical Dictionary and Marine Review.....	6 00
Engineering, (London), Weekly.....	10 00
Engineering, (London), Weekly and Marine Review.....	10 00
The Engineer, (New York), Semi Monthly.....	2 00
The Engineer, (New York), and Marine Review.....	3 80
Engineering, (New York), Monthly Magazine.....	3 00
Engineering, (New York) and Marine Review..	4 00
Emerson Binder, (that will hold 52 Nos. of the Marine Review).....	75

WESTERN OFFICE,
210 So. Water St.,
CHICAGO, ILL.

MARINE REVIEW,
510 Perry-Payne Bldg., CLEVELAND, O.

The Swain Wrecking Co.

- under the management of -
Parker & Millen.
 DETROIT, MICHIGAN.

The Tug Favorite

STATIONED AT CHEBOYGAN, MICH.
 WITH COMPLETE WRECKING OUTFIT IN
 CHARGE OF CAPT. MARTIN SWAIN.

"THE CANADIAN WRECKER SAGINAW"
 STATIONED AT DETROIT, MICH. ENABLES US TO
 WRECK IN CANADIAN WATERS.

"STEAM PUMPS AND SUB-MARINE WORK"
 IN CHARGE OF JOHN S. QUINN,
 ADDRESS ALL COMMUNICATIONS TO
PARKER & MILLEN.
 OFFICE 15 ATWATER ST. WEST,
 DETROIT, MICH.



INMAN LINE

• TUGS •
 RECORD,
 M. D. CARRINGTON
 BUFFALO,
 J. L. WILLIAMS,
 JOE. DUDLEY.

B. B. INMAN
 MANAGER

OFFICE N. P. DOCK
 DULUTH, MINN.

• TUGS •
 EFFIE L,
 WALTON B,
 PEARL B. CAMPBELL,
 LIDA,
 FIRE-BOAT
 DAVID DUDLEY



STEAM PUMPS, HAWSERS, LIGHTERS AND DIVING SUITS FURNISHED ON SHORT NOTICE.

L. P & J. A. SMITH, Contractors of Public Works, CLEVELAND, O.

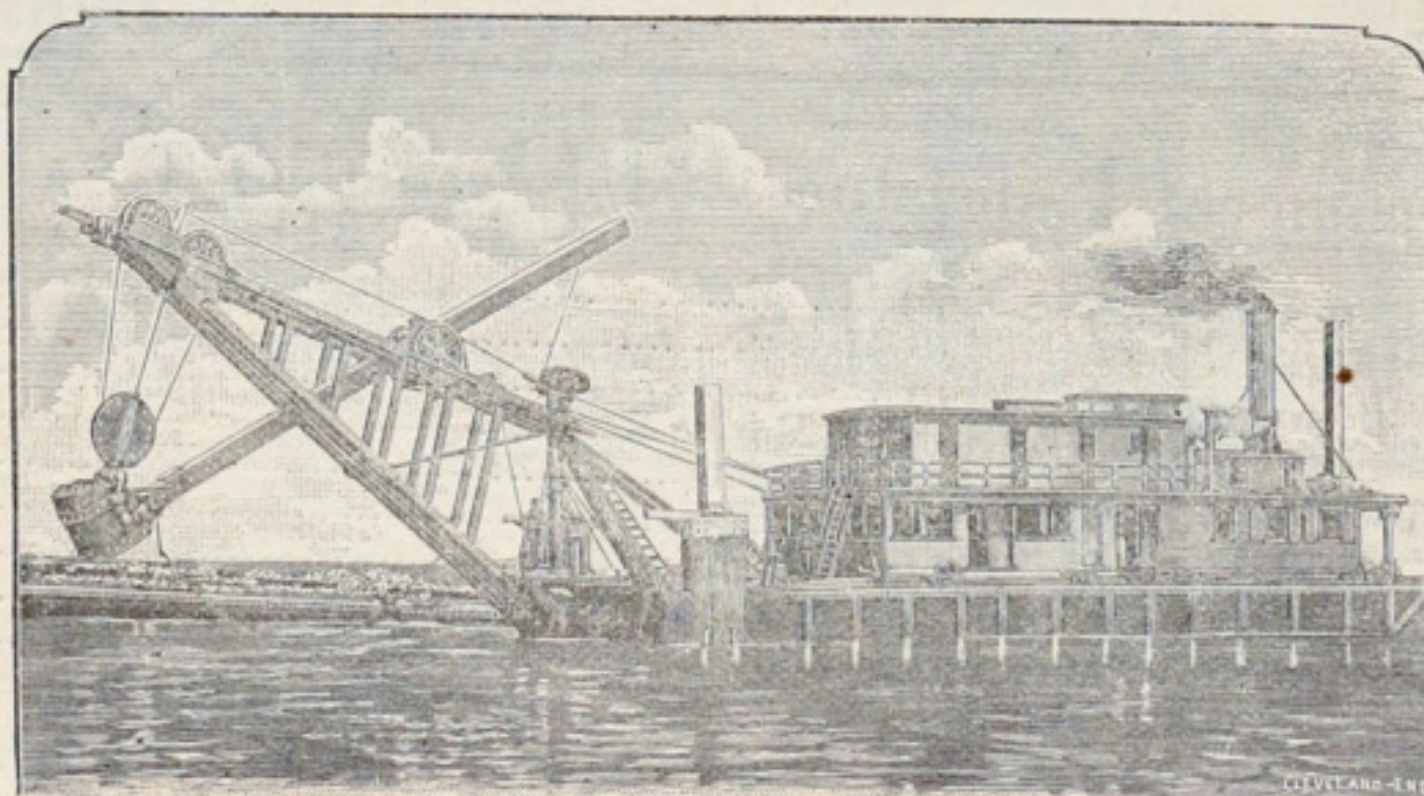
DREDGING,

PILE-DRIVING,

BREAKWATERS,

DRY DOCKS and

PIER BUILDING.



RAILROADS,

CANALS,

BRIDGES,

FOUNDATIONS,

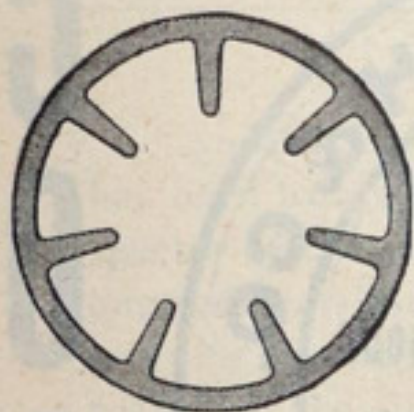
&c., &c.

OFFICE: No. 1 FRONT ST.

S. F. HODGE & CO.

MARINE ENGINES,
PROPELLER WHEELS,
DECK HOISTERS,
MARINE REPAIRS.

320 ATWATER STREET,
DETROIT, MICH.



SERVE'S PATENT

Ribbed Boiler and Stay Tubes

Show an average economy in fuel of 15 per cent.
In steamers, this means not only so much
saving in cost of coal, but additional
freight capacity.

Full particulars on application.

Purves' Patent Ribbed Boiler Furnace Flues.

Nearly 10,000 Purves' Patent Ribbed Furnace Flues,
of which this cut is a section, are in use in Marine
Boilers. Besides having greater strength to resist
collapse than any other furnace made, they possess
many additional advantages which we shall be happy
to enumerate on application.

CHARLES W. WHITNEY,

Representing Messrs. JOHN WILLIAMS & Co., Liverpool, Sole Agent for the United States
and Canada.

81 & 83 FULTON STREET, NEW YORK.



93 Liberty St. 113 Federal St.
NEW YORK. BOSTON.

IMPROVED PUMPING MACHINERY For Every Class of Work. Send for New Illustrated CATALOGUE

THE CONDIT FULLER CO.

BAR IRON, SHEET IRON, PLATE IRON, PIC IRON,
BOILER TUBES, BOILER RIVETS, PLATE STEEL,
CAS PIPE, BOAT SPIKES,
CLINCH RINGS, CLEVELAND, O. STEEL NAILS.

1850.

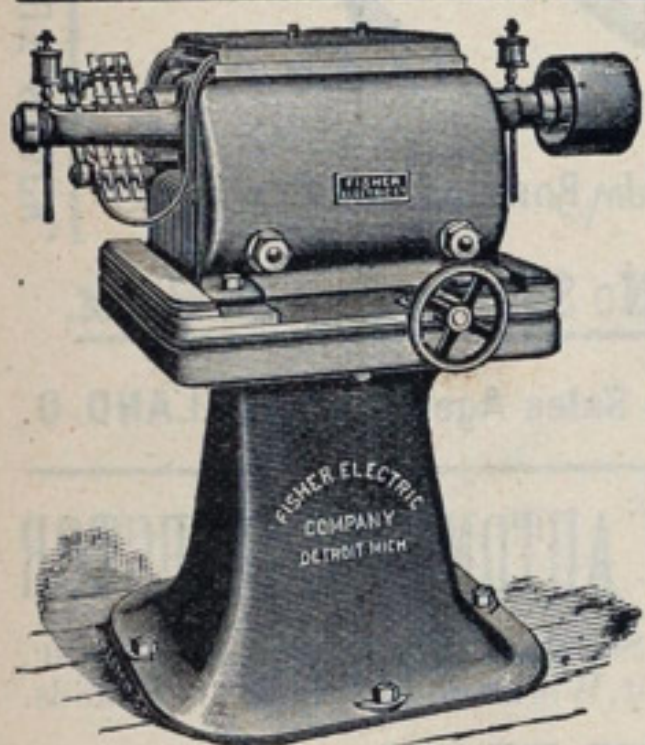
J. F. PENNRICH,

1892.

Manufacturer of all Grades of

MATTRESSES, PILLOWS & BEDDING,
MARINE AND HOTEL WORK A SPECIALTY.

Telephone 1691. Nos. 512 to 516 Lorain St., CLEVELAND, O.



THE INCANDESCENT LIGHT

Is the only safe means of illuminating Passenger, Freight or
Excursion Steamers. All other illuminants are dangerous. The
Fisher system is Automatic in its operation, perfect in every de-
tail, and does not require a skilled expert.

FISHER ELECTRIC CO.

183, 185 & 187 Larned St., DETROIT, MICH.

MARINE VALVE OIL

For Cylinder Lubrication is used in
90 per cent. of the large steam-
ers on the great chain of lakes.

— IN STOCK AT —

Standard Oil Company's Marine Depot,

123 River St., CLEVELAND, O.

Telephone 77.

Main Office Telephone 682.

Marine Valve. Mineral Seal.
Eldorado Engine. Renown Engine. } For Dynamos
Dark Lubricating. Crank Case Oil. } and Electric
Victor Signal. Lard Oils. } Light Plants.
Illuminating Oils. Arctic Cup Greases.



TRADE MARK BRANDS ALSO FOR SALE

— BY —

STANDARD OIL COMPANY, No. 5 Wabash Ave., Chicago, Ill.
" " " " Racine, Wis.
" " " " Broadway & Mason, Milwaukee, Wis.
" " " " Sheboygan, Wis.
" " " " Manitowoc, Wis.
" " " " Green Bay, Wis.
" " " " Marinette, Wis.
" " " " Oshkosh, Wis.
" " " " Duluth, Minn.
" " " " West Superior, Wis.
" " " " Hancock, Mich.
" " " " Marquette, Mich.
" " " " Sault Ste. Marie, Mich.
" " " " Michigan Central Railway & 10th St.,
" " " " West Bay City, Mich.
" " " " Eighth & Sears Sts., Saginaw, Mich.
" " " " 46 Jefferson Detroit, Mich.
" " " " Summit & Monroe Sts., Toledo, O.
ACME OIL COMPANY, French & 16th Sts., Erie, Pa.
STAR OIL COMPANY, 17 & 19 Swan St., Buffalo, N. Y.
A. H. MCGONAGIL, South Chicago, Ill.
D. ROBESON, Port Huron, Mich.
BABY & DALE, St. Clair, Mich.
MARINE SUPPLY CO., Fairport, O.
W. S. MCKINNON, Ashtabula Harbor, O.
N. C. ALTEN, Lorain, O.
F. KRANZ, Sandusky, O.

THE KING BRIDGE CO.

CLEVELAND, O.,

Iron and Steel Bridges. Girders. Buildings and Structural Work of all kinds,
Hoisting and Conveying Machinery for Handling Ore, Coal, &c.

The Martin-Barriss Co.

IMPORTERS AND MANUFACTURERS OF

Mahogany, White Mahogany,

AND ALL NATIVE CABINET WOODS.

HIGH GRADES OF KILN DRIED WOODS FOR
CABIN WORK AND INSIDE TRIM.

White Oak Timbers and Plank

CONSTANTLY ON HAND AND SAWED TO ORDER
ON SHORT NOTICE.

654 Seneca Street,

Cleveland, Ohio.

THE MARINE BANK CO.

CLEVELAND, OHIO.

CAPITAL, \$300,000.

Incorporated under the laws of Ohio in 1891.

Successor to E. B. HALE & CO., Established in 1852.

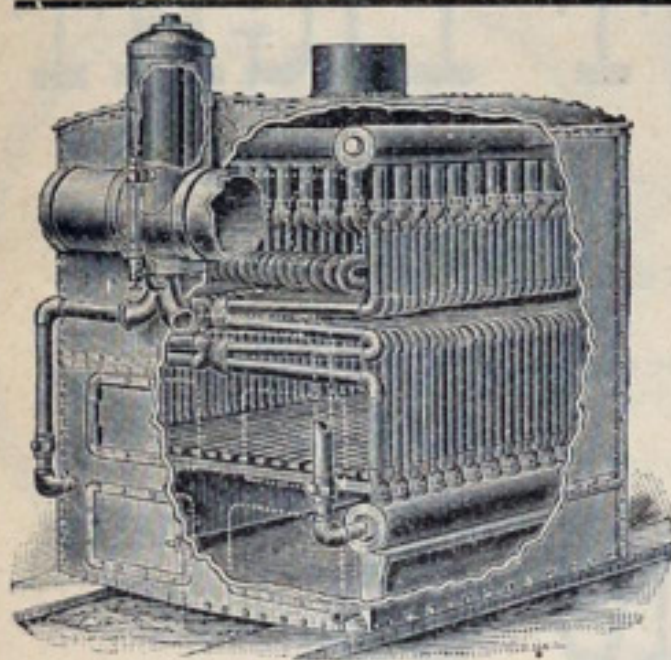
DIRECTORS:

W. H. BARRISS, PRESIDENT. HENRY C. RANNEY, VICE-PRES'T.
W. B. HALE, Cashier.

MARTYN BONNELL.
THOS. FITZPATRICK.

C. E. BURKE.
THOS. H. WHITE.

We give special attention to Marine Business.



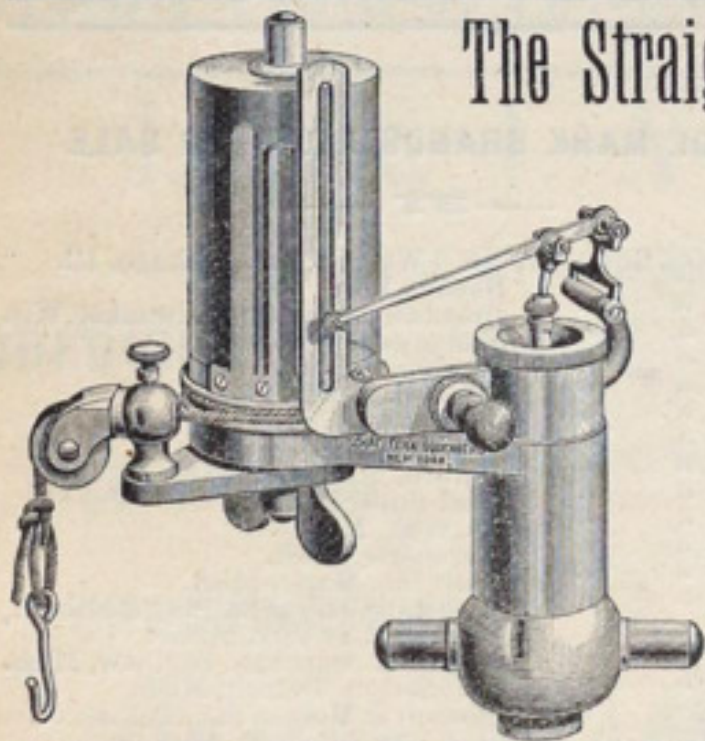
ALMY'S PATENT SECTIONAL WATER TUBE BOILERS

FOR

**:: MARINE and ::
STATIONARY WORK**

Manufactured by
ALMY WATER TUBE BOILER CO.
Providence, R.I.

"The use of boilers of the coil type in vessels of small displacement and enormously large power is already a necessity, and it will not be many years before their use will be general in all steam vessels."—Engineer-in-Chief Melville, U. S. N.



The Straight "LYNE" Indicator,

Adapted for Engines of all speeds.

For Simplicity, Reliability,
Excellence of Workman-
ship, it has no superior.

Sold at a Moderate Price.

Send for Descriptive Catalogue.

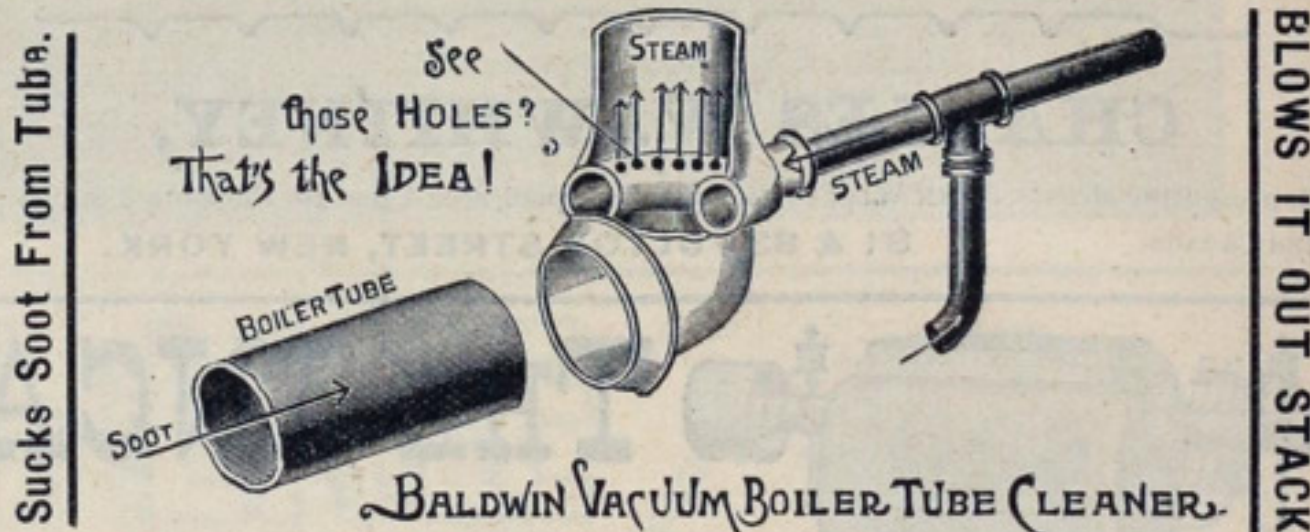
SCHAFFER & BUDENBERG,

Works: Brooklyn, N. Y.

Sales Rooms:
No. 18 So. Canal St., No. 83 John St.,
CHICAGO. NEW YORK.
Builders Exch'ge, Room 402, Phila., Pa.



SOOT SUCKER



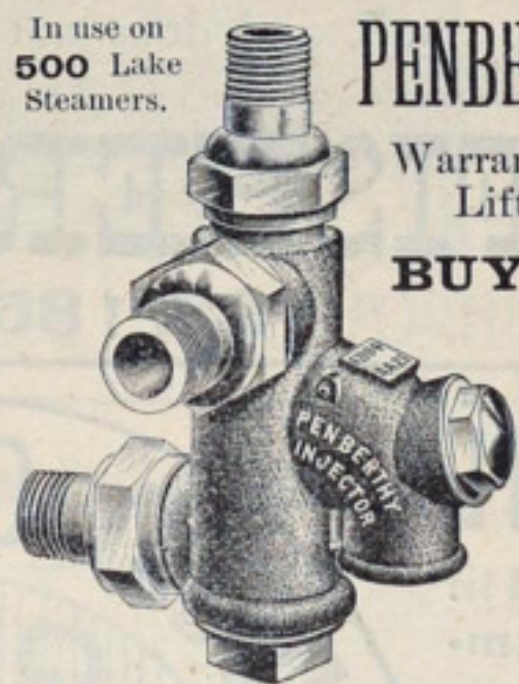
No STEAM IN THE TUBE. No SOOT IN BOILER ROOM.

THE OLIVER P. CLAY CO., Sole Sales Agents, CLEVELAND, O.

In use on
500 Lake
Steamers.

PENBERTHY AUTOMATIC INJECTOR

Warranted Re-Starting, Absolutely Automatic,
Lifts 20 Feet, Works 25 to 150 or 200 Pounds.



BUY THEM FROM S. F. HODGE & Co.
Detroit; CLEMENTS & SON, Bay City; J. H.
RUCKEL & Co., Buffalo; SCOTT VALVE Co., R.
J. DILLON & Co. or MARINETTE IRON WORKS,
Chicago; C. H. PRESLEY, Cleveland; SHAW,
KENDALL & Co., Toledo; ERIE CITY IRON
WORKS, Erie; RUNDLE, SPENCE & Co., Mil-
waukee, or

PENBERTHY INJECTOR CO.

7th and Abbott Streets,
DETROIT, MICH.

OMAR D. CONGER.

CHILTON P. CONGER.

Conger & Conger, Attorneys and
Counsellors at Law,

No. 45 Corcoran Building, Washington, D. C.

We make a specialty of all Marine and Shipping Business before the Treasury Department and Congress. Patent Business. Practice, Court of Claims and U. S. Supreme Court.

MARINE FOUNDERS USE OUR C. F. M. FOUNDERS PERFECT WASH.

For LOAM, DRY SAND AND SKIN DRIED CASTINGS. HAS NO EQUAL IN THE WORLD.

PERMIT US TO DEMONSTRATE THIS.

CLEVELAND FACING MILLS, CLEVELAND, O.